International Lithosphere Program*

Annual Report 2010

With a review of the past 5 year period and outlook to the next 5 years

* The ILP-homepage provides information on all aspects of ILP: http://www.scl-ilp.org/

REPORT OF ILP – INTERNATIONAL LITHOSPHERE PROGRAM

1. TITLE OF CONSTITUENT BODY AND NAME OF REPORTERS

Prof. Dr. Sierd Cloetingh, President (VU University Amsterdam)
Prof. Dr. Roland Oberhänsli, Secretary General (Universität Potsdam)
Dr. Alexander Rudloff, Executive Secretary (GFZ Potsdam)

ILP – an IUGS and IUGG initiative established by ICSU (International Council of Scientific Unions) in 1980

2. OVERALL OBJECTIVES

The International Lithosphere Program (ILP) seeks to elucidate the nature, dynamics, origin and evolution of the lithosphere through international, multidisciplinary geoscience research projects and coordinating committees.

The ILP is charged with promoting multidisciplinary research projects of interest to both the geological (IUGS) and geophysical (IUGG) communities.

The ILP seeks to achieve a fine balance between: *"addressing societal needs"*, e.g. understanding natural catastrophes and other solid earth processes that affect the biosphere, providing information for improved hazard assessment, resource exploration, geomedicine and environmental protection; as well as *"satisfying scientific curiosity"*.

According to the Terms of Reference published in 2008 ILP is a body of IUGG and IUGS.

3. FIT WITHIN IUGS AND IUGG POLICY

- IUGS and IUGG are represented in the ILP Bureau.
- ILP cooperates with IUGS and IUGG on the follow-up initiatives to the International Year of Planet Earth (IYPE); the ILP President was a member of the board of IYPE Corporation. In this context ILP was leading the IYPE theme Deep Earth, published in a special brochure and, in addition, is financially supporting IYPE. ILP will take the lead in representing solid earth sciences in the future Planet Earth Institute.

4. ORGANISATION

ILP has an international Bureau with members from several countries that meet annually to monitor progress and to select new programmes and activities in close consultation with the representatives of National Committees. The Bureau is chaired by the President, with support from the Secretary General..

The Bureau was restructured during the Bureau meeting in Vienna on 20 April 2009. As new chair person for the National Committees Dr, Victoria, L. Pease was elected. During the Bureau meeting 2010 in Vienna Sierd Cloetingh was re-elected as President and Professor Hans Thybo was nominated as a new associate Bureau member.

Bureau membership

Executive Members:			
President:	S. Cloetingh	Netherlands	
Secretary General:(since mid 2008)	R. Oberhänsli	Germany	
with Executive Secretary:	A. Rudloff	Germany	
Chairperson – Committee of National Representatives:	V.L. Pease	Sweden	
Honorary President	A. Green	Switzerland	
ILP Fellow	J.F.W. Negendank	Germany	
Representatives of IUGG & IUGS:	K. Furlong	USA	IUGG
	K. C. Sain	India	IUGG
	J. Charvais	France	IUGS
	Y. Tatsumi	Japan	IUGS
	A. Green	Switzerland	IUGS & IUGG
Associate Members:	J.-P. Burg	Switzerland	
	H. Thybo	Denmark	
	A. Morozov	Russia	
	F. Roure	France	
	M. Zoback	USA	
	R. Missotten	UNESCO	
Lifetime Members:	P. Ziegler	Switzerland	
	M. von Knorring	Sweden	
	H. Gupta	India	

The Bureau members evaluate submitted projects (task forces, coordinating committees, workshops) and decide on their approval according to the criteria of ILP.

EXTENT OF SUPPORT FROM SOURCES OTHER THAN IUGS AND IUGG

ILP is basically financed by IUGS and IUGG (each 15,000 US $ up to 2008). In 2009 IUGS lowered its support, and the Bureau has raised and is still raising funds via the national committees and other bodies from the participating countries (e.g. National Science Foundations, Academies; see list of contributing countries 2008 and 2009). As a result France became a supporting member of ILP in 2009. During 2010 several efforts in raising national support and acquainting new member countries were undertaken. In this context the Arab Emirates, Jordan and Saudi Arabia were approached. The new head of the national committees initiated systematic efforts to contact additional countries.. For the 2010 Potsdam meeting our Bureau hosting

organisation the Deutsches GeoForschungsZentrum Potsdam and the University of Potsdam supported ILP with logistics and finances.

ILP is greatly indebted to the GFZ German Research for Geosciences at Potsdam for its continuing and long-lasting support.

Country/Institution:	**Sum paid in 2009:**	**Sum paid in 2010:**
China	2,000.00 US $ 2,000.00 US $	2,000.00 US $ (2011)
Czech Republic	400.00 US $	400.00 US $
Denmark	2,000.00 US $	2,000.00 US $
Finland	1,000.00 US $	1,000.00 US $
France	5,000.00 US $	
Germany	5,000.00 €	
IUGG	15,000.00 US $	15,000.00 US $
IUGS	5,000.00 US $	10,000.00 US $
India	2,000.00 US $ (2009)	
Netherlands (ISES)	5,000.00 €	5,000.00 €
Sweden	3,400.00 US $	3,400.00 US $
Switzerland	2,000.00 US $	2,000.00 €
Academy of Sciences in Taipei	700.00 US $	
USA	8,000.00 US $	8,000.00 US $
Total:	**46,500.00 US $** **7,000.00 €**	**41,800.00 US $** **12,000.00 €**

In future ILP will make special effort towards emerging countries and will intensify its partnership with industry.

4. INTERFACE WITH OTHER INTERNATIONAL PROJECTS

ILP stimulates and supports the Task Forces and Regional Coordinating Committees with 4,000 US $ per year over a period of 5 years. This basic support ("seed money") is used by the project leaders to raise additional funds for their scientific activities, while there is a strong existing interface with other projects (e.g. ICDP, TOPO-EUROPE, TOPO-CENTRAL ASIA, TerMeX).

5. MAIN ACCOMPLISHMENTS IN 2010

ADMINISTRATION

- **Joint IUGS-IUGG meeting in Paris, France, 20 February 2010**

Both President and Secretary General attended the IUGS - IUGG meeting held at the UNESCO in Paris to report on ILP matters. S. Cloetingh gave a brief report on the scientific achievements of ILP stating amongst other things that:

- Tectonophysics became the ILP journal
- ILP as founding partner of the IYPE will support the Planet Earth Institute
- Several Task Force meetings will be organised during 2010
- The ILP's 2nd conference on the theme "Solid Earth – Basic Science for the Human Habitat" will be held in October 2010 in Potsdam where the Task Forces will present their work plans and objectives for the next 5 years.

The ILP leadership pointed out that a successful program absolutely needs support from the mother organisations IUGG as well as IUGS. As a result of these efforts IIUGS raised its funding, although – due to financial constrains – not yet to its original level.

ILP thanks IUGS for this rise in funding.

- **Bureau meeting of ILP, Vienna, Austria, 3 May 2010**

Minutes of the SCL/ILP Bureau Meeting at the EGU 2010 meeting, Austria Centre Vienna, Room SM1 3 May 2010, 18:00-19:00

Minutes of the ILP Bureau Meeting during the EGU General Assembly 2010, Austria, 3 May 2010

18:00 h – 20:15 h, Austria Centre Vienna, Room SM2

Attendees, see Annex 1

Agenda

ILP Bureau Meeting

EGU European Geosciences Union - General Assembly Vienna, Austria, 3 May 2010

1 Welcome of the Delegates
2 Introduction to New Members
3 Report of the President
4 Report of the Secretary General
5 Report on IYPE
6 Elections
7 New Task Forces
8 All other business

The delegates are welcomed by the ILP President Sierd Cloetingh; the meeting agenda is agreed upon.

28 scientists attend the ILP bureau meeting, representing the Czech Republic, Denmark, Finland, France, Germany, Italy, Japan, the Netherlands, Sweden, Switzerland, Turkey, and the United States. Representatives from IUGG, IUGS, IYPE, and NSF are also present.

Victoria Pease is welcomed as the new chairperson of the national committees. She is the successor of Sören Gregersen.

Report of the President

- Sierd Cloetingh reports on a visit to IUGS/IUGG at UNESCO in Paris. In view of the evaluation of the "mother" societies of ILP in late 2010/early 2011, the President encourages the task forces and coordinating committees to summarize briefly their cutting edge science within ILP. He also stresses the importance of the visibility of ILP as a funding and supporting programme.
- The President reports on the further activities of the last year, including the successful ILP Springer publication "New Frontiers in Integrated Solid Earth Sciences".
- The President invites all delegates to participate and to promote ILP's 2nd Potsdam Conference on the theme: "Solid Earth – Basic Science for the Human Habitat", scheduled for 6-8 October 2010 and hosted by GFZ.

Report of the Secretary General (SG)

- Roland Oberhänsli states that the financial situation of ILP is stable. Nevertheless the annual support to the task forces and Coordinating committees will have to be slightly reduced, due to the increasing number of ILP projects.
- The SG informs that the United Emirates, Saudi Arabia, and Jordan have been invited to establish national committees, which might also bring financial funding for the ILP programme. He outlines the importance of the chair of the national committees.

Report on International Year of Planet Earth (IYPE)

- Eduardo de Mulder reports in his capacity as IYPE director on the activities of the IYPE initiative and gives an overview of future perspectives. One idea is to build up a Plan et Earth institute as a sustainable measure.
- De Mulder gives credits to ILP as a founding member of IYPE. He is also acknowledges ILP for publishing the special volume on "Frontiers in Integrated Solid Earth Sciences", edited by Cloetingh & Negendank. This book has appeared as the first in line of the Springer series on scientific highlights of IYPE.

Elections

- Alan Green, bureau member with the support of IUGG and IUGS and Honorary President of ILP, proposes Sierd Cloetingh for a second period of presidency. Green acknowledges Cloetingh's efforts and states that his first period has been extremely positive and successful.
- Green reports from his own experience as President of ILP and outlines the importance of personal continuity in times of restructuration. All delegates fully support the nomination. The Honorary President will submit this vote to the Presidents of IUGS, Alberto Riccardi and IUGG, Tom Beer.

- Furthermore, Hans Thybo is elected as new bureau member, replacing David Gee. The bureau and the delegates thank David Gee for his continuous support to ILP.

News Task Forces

- The present leaders of the new ILP task forces give a short introduction to their work plans and expected results. Additional short reports are given by acting groups.

All other business

- All delegates are invited to submit suggestions for the Flinn-Hart-Award. One name proposed by the audience is Dirk Spengler, a Deep Earth mineralogist.

Alexander Rudloff, Executive Secretary of ILP

Impressions from the ILP business meeting 2010:

Secretary General and President of ILP,
Roland Oberhänsli (left) and Sierd Cloetingh (right)

Attendees and delegates follow the reports

List of attendees given in appendix.

- **Informal Bureau meeting Potsdam, 8 October 2010**

This informal meeting was held with Task Force and Coordination Committee leaders attending the ILP Potsdam conference.
The Bureau was informed about the IUGG/IUGS review in Paris and the fact that ILP is about to be evaluated by the two mother unions. This lead to the request for early reports, in order to supply a full report to the evaluation committee in time,

It was decided to publish the abstracts submitted for the second Potsdam conference electronically. This process was completed by the end of 2010 by registering the abstract volume with individual DOI numbers (see appendix).

A discussion on new Task Forces and Coordination Committees lead to the conclusion that despite reduced funding, a larger number of Task Forces will be approved and financed with a slightly reduced contribution from ILP.

Dr. D. Spengler was nominated as next candidate for the Flinn-Hart ILP Prize.

SCIENCE AND RESEARCH

This section compiles symposia and workshops that were organized under the auspices of ILP. The full reports as well as the lists of publications of the Task Forces are given in the appendices.

- **EGU General Assembly, April 2010, Vienna**
  During the 20100 meeting the following Task Forces orgainzed sessions and special symposia:

  TF II: "Volcano tectonics", Chairs: A. Gudmundson, V. Acocella.

  TF VI: "Basin Dynamics" 12 oral presentations and 40 posters. The session was co-organized by the divisions of Geodynamics, Tectonics & Structural Geology and Stratigraphy, Sedimentology & Palaeontology, with Convener Magdalena Scheck-Wenderoth and Co-Conveners Francois Roure, Christophe Basile , Virginie Gaullier.

  TF IV: "New insights into Deep Earth Part III: Ultra-high pressure metamorphism and deep sbduction: Observations on natural rocks and experimental modeling.

  TOPO EURO: Special symposium, co-sponsored by ESF, Conveners: S. Cloetingh, S. Willett

- **AGU Western Pacific Geophysical Meeting 2010, May 22-25, Taipe Taiwan**
  TF IV: High-pressure and ultrahigh-pressure metamorphic processes during subduction and collision".

- **Goldschmidt Conference 2010, June 13-19 Knoxville, USA**
  TF IV: "Frontiers of ultrahigh pressure metamorphism: mineral reactions, isotope characteristics, phase transformations, fluids and solid state flow".

- **AGU Fall meeting 2010**
  TF IV: "25 years after the discovery of coesite and diamond".

- **ESF Research Conference, 11-16 September 2010, Obergurgl, Austria,:**
  TF V: "Submarine Paleoseismology: the offshore search of Large Holocene Earthquakes". 66 participants of which 26 invited speakers, 27 invited talks and 15 short talks, grouped in 6 sessions; 52 posters.

- **First Iberian Meeting on Active Faults and Paleoseismology, 27. – 29. October 2010, Siguenza**
  TF V in collaboration with Universidad Complutense de Madrid, Universidad de Barcelona and Instituto Geologico y Minero de Espana organized this conference.

- **Workshop "Geodynamic Evolution, Tectonics and Magmatism of the central Asian Orogenic Belt, Novosibirsk & field excursion to Gorny Altay, 20. – 30. June 2010:**
  The Institute of Geology and Mineralogy of the Siberian Branch of the Russian Academy of Sciences in Novosibirsk, Russia, organized an international field excursion to the Russian (Gorny) Altay, followed by a two-day workshop in

Novosibirsk to discuss progress in research on the evolution of the Central Asian Orogenic Belt. The field excursion attracted eighteen participants from 8 countries, namely Germany, England, Japan, China, France, Czech Republic, Poland and Russia. The participants made 29 oral and 9 poster presentations during the workshop within four scientific sessions: 1) Geodynamic evolution of the Central Asian Orogenic Belt and problems of continental growth: role of mantle plumes, Gondwana blocks and subduction-accretion belts; 2) Evolution of palaeo-oceans and active continental margins: sedimentary, oceanic, accretionary and island-arc complexes; 3) Collisional tectonics and geodynamics: orogenic and post-orogenic magmatism, suture-shear zones, strike-slip faulting; 4) Geodynamics and metallogeny.
Contributions are summarized in a 145 page abstract volume that will be published as special volume of the international jounal “Russian Geology and Geophysics”.

- **Workshop: “DYNAMICS and ACTIVE PROCESSES: the ALBANIAN NATURAL LABORATORY and ANALOGUES 7 -12 November 2010, Tirana.**
  Thanks to the help of the local organizing committee, an excellent 6th workshop of the task force took place from November 7-12, 2010 in Tirana, hosted by the Polytechnic University of Tirana (PUTirana) in the realm of TF VI. Participants from several countries have attended 3 days of conference, as well as one pre-conference field trip to the Mirdita Ophiolite and one post-conference field trip to Vlora and Saranda (Ionian Zone). Proceedings are to be published in 2011 in a special issue of the Italian Journal of Geosciences.

- **Second ILP Potsdam conference 6. – 8. October 2010**
  ”Solid Earth - Basic Science for the Human Habitat” was organized by the ILP Bureau. The meeting was well attended and gave a concise review on the work of the outgoing Task Forces as well as highlights and outlooks on the newly established Task Forces and Coordination Committees. The program of the conference is attached in the appendix. Along with the conference an informal Bureau meeting was held with the participation of old and new Task Force leaders.

Welcome address of the ILP president Sierd Cloetingh on the occasion of the ILP reception in the historic Kutschstall in Potsdam

6. New Task Forces & Coordinating Committees in the realm of the major ILP themes:

I. Geoscience of global change
- TF 3: Bridging the gap from microseismicity to large earthquakes
- TF 10: The Unconventionals

II. Contemporary dynamics and deep processes
- TF 4: Continental Collisional Orogens: from Atomic Scales to Mountain Building
- TF 8: Tracking supercells through Earth history
- TF 9: DISC - Deep Into the Subduction Channel

III. Continental lithosphere
- TF 1: CALE - Circum Arctic Lithosphere Evolution
- TF 2: Volcanoes and society: environment, health and public outreach
- TF 3: Bridging the gap from microseismicity to large earthquakes
- TF 4: Continental Collisional Orogens: from Atomic Scales to Mountain Buildings
- TF 5: LAPBOX - The lithosphere-asthenosphere boundary depth paradox
- TF 6: Sedimentary Basins
- TF 7: 3D Geomechanical modelling of geodynamic processes in the lithosphere

IV. Oceanic lithosphere
- TF 1: CALE - Circum Arctic Lithosphere Evolution

Coordinating Committees:
- TOPO-EUROPE
- TOPO-Central Asia
- DynaClim
- MEDYNA - Mantle Dynamics and Plate Architecture Beneath North Africa

The activities of the past projects (Task Forces and Regional Coordinating Committees) are also documented in the bibliography (see homepage and annex).

7. SUMMARY OF INCOME &EXPENDITURES IN 2010

The negotiations with the German tax officers to recognize ILP as a non-profit organization are continued. Despite the reduction in support of IUGS, the Bureau decided to handle Task Forces support in Euro. For simplicity the support sum of 5,000.- US $ per Task Force was slightly augmented to 4,000.- EUR per Task Force in 2009. Due to the increasing number of Task forces and the tight financial situation 2010 only 3200 € were allocated to each Task Force.

(per 30 November 2010)

<u>Expenditure in 2010:</u>	
• Scientific activities/symposium support:	35,302.58 EUR
	7,910.00 US $
• Travel costs of Officers:	4,388.00 EUR
• Expenses related to ILP secretariat: (homepage, postage etc.)	60.00 EUR
• Bank charges:	45.20 US $
	313.25 EUR
Total:	**40,063.83 EUR**
	7,955.20 US $
<u>Income in 2010/Excess of former years:</u>	
• Annual contributions of various countries, IUGG and IUGS subvention[·]:	8,000.00 US $
	38,748.10 EUR
• Rest Dollar account from 2009:	2,020.85 US $
• Rest Euro account from 2009:	20,541.85 EUR
• Interests:	1,767.00 EUR
• Fees ILP's 2nd Potsdam Conference:	2,310.00 EUR
Total:	**63,366.95 EUR**
	10,020.85 US $
Balance Income/Expenditures:	**23,303.12 EUR**
	2,065.65 US $
Deposit:	**60,543.84 EUR**

As seen from the above compilation, ILP will probably be able to increase the Task Force support per 2011, in case no further Task forces will be selected.

8. WORKPLAN FOR 2011

- Publications in *EOS*, *Episodes* and in *Earth Science Reviews* in preparation
- Advertising for new support by national science foundations and industry
- Several sessions at EGU-meeting Vienna, 3 – 8 April 2011
- ILP Bureau meeting and ILP-session at EGU in Vienna

[·] IUGG: 12,168.00 EUR (15,000 US $), IUGS: 7,817.97 EUR (10,000 US $)

- Joint meeting of TOPO-EUROPE & TOPO-CENTRAL-ASIA (Regional Committees) in Bishkek, Kyrghyzstan (Central Asian Institute for Applied Geosciences),
- 7th workshop of Task Force ”Sedimentary Basins” in Capetown/South Africa

9. WORK PLAN FOR THE NEXT 5 YEARS

It is the intention of the President and the Bureau to stimulate further projects relating to the TOPO-EUROPE philosophy on all other continents.
Since 2009 the running Task Forces ended their 5 years period, new Task Forces were installed in 2010 and their scientific goals were presented during the Potsdam conference in October 2010. Their effective work and outreach will be visible by 2011.
The ILP conference in Potsdam provided a comprehensive international forum for dissemination of the results of the activities of the last 5 years period. In addition, the basic focus and science plans for the Task Forces operating for the next 5 year period were presented. The outcome of the Potsdam meeting is an electronic publication (http://dx.doi.org/10.2312/GFZ.ILP000). The meeting was experienced by the participants as an expression of strong commitment and community building in the framework of integrated solid earth science.
Further on, the organization of international conferences with ILP-activities will be in the focus in the coming years, as it has been implemented at e.g. AGU, EGU, IUGG, IUGS, IGC in the previous years.
The Secretary General and his office members will continuously try to enhance fund raising by solicitating new National members. It is also aimed to involve industrial partners as sponsors of this highly visible program.

Potsdam, 8 December, 2010

Sierd Cloetingh, Roland Oberhänsli & Alexander Rudloff

International Lithosphere Program*

Annual Report 2010

Appendices

a) ILP Conference E- book
b) List of published papers
c) Task Force reports and outlooks

* The ILP-homepage informs about all aspects of ILP: http://www.scl-ilp.org/

ILP Bureau Meeting 2010 – List of participants

EGU General Assembly, Vienna
Room SM 1 - Monday 3 May 2010, 6:00 – 8:00 p.m.

No.	Surname, Name	Organisation	ILP Task Force	Signature
1	Sierd Cloetingh	VU-ISES	Pres.	
2	Roland	Potsdam	SG	
3	Rudloff, Alexand	GFZ	ESc	
4	Larissa Dobrynina	UCL	Task-Force	
5	Vicky	SU, SWEDEN	VI	Victoria Pease
6	Bilal U. Haq	NSF	Ex officio	
7	Jacques Charvet	IUGS		
8	Ulrich A. Glasmacher	Uni. Heidelberg		
9	Olivia Heidbach	GFZ Potsd	TF VII	
10	Markku Poutanen	FGI	DynaQlim	
11	Pekka Heikkinen	Uni Helsinki	Finnish Nat. Com.	
12	Hiroshi SATO	Earthquake Research Institute, Univ. Tokyo		
13	Jean-Pierre Burg	ETH Zürich		
14		ETH Zurich		
15	Alexandra Negri	UNIVERSITY MILAN BICOCCA	T.F. VOLCANOES	

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No.	Surname, Name	Organisation	ILP Task Force	Signature
16	Magdalena Scheck-Wenderoth	GFZ Potsdam	6 Sed. Basins	
17	François BOURÉ	IFP	Sed. Basin	
18	Philippe AGARD	Univ. P.M.Curie (PARIS 6)	New! (Subd. channel)	
19	Ulrich Achauer	UdS	VIII	
20	Alexey Shulgin	IFM-GEOMAR	I	
21	Irina Artemieva	Univ. Copenhagen	III, TBV, Topo	
22	Hans Thybo	— " —	cc 1/3	
23	Arol Okay	ITU	New Subd Chan	
24	Vladislav Babuška	Geoph. Inst. Prague	8	
25	Jaroslava Plomerová	— " —	8	
26	Olivier LACOMBE	UPMC Univ. P. M. Curie	Sed Basin Stress and Strain	
27	ALIK ISMAIL-ZADEH	KIT, Germany	IUGG	
28	Eduardo de Mulder	IYPE	IYPE	
~~30~~ 29				

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Appendix

a) ILP Conference E- book

* The ILP-homepage informs about all aspects of ILP: http://www.scl-ilp.org/

International Lithosphere Program – ILP

"Solid Earth – Basis Science for the Human Habitat"

ILP's Second Potsdam Conference
6-8 October 2010

GFZ German Research Centre for Geosciences

Programme & Proceedings

Edited by
Alexander Rudloff, Roland Oberhänsli & Sierd Cloetingh

October 2010

ILP's Second Potsdam Conference, 6-8 Oct. 2010

Introduction

In July 2007 GFZ hosted the ILP's first Potsdam Conference, titled "Frontiers in Integrated Solid Earth Sciences". The results of this meeting were presented in an over 400 pages large Springer book, the first volume of a new series on the International Year of Planet Earth (IYPE).
This time we were happy to welcome the ILP family and friends in autumn to Potsdam. Overall more than 70 scientists from more than 20 states worldwide came together and shared their results, ideas and visions.

Group picture

Acknowledgements

The organizers highly appreciated the motivated support by Anne Jähkel and Oliver Oswald during the conference. Without Christine Gerschke's work before, during and after the conference it would not has been possible to host such an event. Thanks to Elisabeth Gantz for the photo documenting of the meeting.

Financial support by the GFZ is gratefully acknowledged.

ILP's Second Potsdam Conference, 6-8 Oct. 2010

Programme

Wednesday, 6 Oct. 2010

12:00 p.m. Registration (GFZ, Building H)

2:00 p.m. Opening Session
Welcome address on behalf of GFZ – Michael H. Weber
Opening – Sierd Cloetingh
Technical remarks – Alexander Rudloff

3:00 p.m. Session: "Circum-Arctic Lithosphere Evolution"
Chair: Victoria PEASE

Pease, V. (8-01): *"Circum-Arctic Lithosphere Evolution (CALE)"*
Jokat, W. (8-02): *"New insights into the tectonic evolution of the Amerasia Basin, Arctic Ocean"*
Stephenson, R. (8-03): *"The topography of the Eurekan Orogen of Ellesmere Island and the Canadian-Greenland polar continental margin"*

4:00 p.m. Coffee Break & Group Picture

4:30 p.m. Session: „Sedimentary Basins"
Chair: Magdalena SCHECK-WENDEROTH

Sippel, J., Scheck-Wenderoth, M., Lewerenz, B., Kröger, K. (9-01): *"The Thermal Field Below Permafrost - A Crustal Model of the Beaufort Mackenzie Basin (Arctic Canada)"*
Autin, J., Scheck-Wenderoth, M., Loegering, M. J., Anka, Z., Vallejo, E., Rodriguez, J. F., Marchal, D., Reichert, C., di Primio, R. (9-02): *"Colorado Basin Structure and Rifting, Argentine passive margin"*
Thybo, H. (9-03): *"Moho and magmatism in extensional settings"*
Roure, F., Scheck-Wenderoth, M. (9-04): *"The ILP Task Force Sedimentary Basins"*

5:50 p.m. Session: „Volcanoes and Society" (Part I)
Chairs: Alessandro TIBALDI, Meral DOGAN

Dogan, A.U., Dogan, M., Peate, D. (10-01): *"Chemostratigraphy concept as applied to some volcanostratigraphic units at Cappadocia, Central Anatolia, Turkey"*
Dogan, M., Dogan, A.U., Balic-Zunic, T. (10-02): *"Chemostratigraphy as applied to some volcanostratigraphic units at Ihlara Valley, Central Anatolia, Turkey"*
Cavallo, A., Dogan, A.U., Dogan, M., Mattioli, M., Renzulli, A., Rimoldi, B., Tibaldi, A. (10-03): "First investigations about erionite and offretite in Italian volcanic environments"
Cardaci, C. (10-04): *"The Civil Protection volcanic risk management in Italy"*

8:00 p.m. ILP Dinner („Historisches Gewölbe" im Kutschstall, Am Neuer Markt 9)

ILP's Second Potsdam Conference, 6-8 Oct. 2010

Thursday, 7 Oct. 2010

8:30 a.m. Session: „Volcanoes and Society" (Part II)
Chairs: Alessandro TIBALDI, Meral DOGAN

Thompson, R. N. (10-05): *"Living beside an explosive volcano during a long eruption requires changes to standard public outreach tactics"*
Sigmarsson, O. (10-06): *"Dynamic magma mixing during the 2010 Eyjafjallajökull eruption, Iceland"*
Apuani, T., Merri, A., Corazzato, C., Tibaldi, A. (10-07): *"Numerical modeling of the Etna flank instability: relations between geological settings, magmatic activity and flank dynamic"*
Rust, D., Teeuw, R., Argyriou, N., Dewdney, C., Solana, C. (10-08): *"Assessing volcano flank instability in Dominica, Lesser Antilles arc"*
Bathke, H., Walter, T. R., Shirzaei, M. (10-09): *"Deformation at Llaima volcano, southern Andes"*

10:10 a.m. Coffee Break

10:40 a.m. Session: "From Microseismicity to Large Earthquakes"
Chair: Marco BOHNHOFF

De Martini, P.M. (1-01): *"Global and Regional Parameters of Paleoseismology; Implications for Fault Scaling and Future Earthquake Hazard"*
Bohnhoff, M., et al. (1-02): *"From Microseismicity to Large Earthquakes: Studies Related to Seismic Hazard Assessment, Carbon Sequestration and Sustainable Resource Management"*
Korjenkov A.M., Rust D., Tibaldi A., Abdieva S.V. (1-03): *"Strong paleoearthquakes along the Talas-Fergana Fault, Kyrgyzstan"*
Shirzaei, M., Walter, T. R. (1-04): *"The 12 Jan 2010, Haiti earthquake affected by a seismic fault slip"*
Sudhaus, H., Walter, T. R. (1-05): *"Strategies for improved earthquake source modelling using InSAR (Interferometric Synthetic Aperture Radar)"*

12:20 p.m. Session: "3D Geomechanical Modelling of Geodynamic Processes"
Chair: Oliver HEIDBACH

Tesauro, M. (4-01): *"Global map of strength and elastic thickness of the lithosphere"*
Elesin, Y., Artemieva, I., Thybo, H. (4-02): *"Numerical modelling of the evolution of Baikal Rift Zone"*

1:00 p.m. Lunch Break

2:00 p.m. Session: "What is the Lithosphere-Asthenosphere Boundary?"
Chairs: Ulrich ACHAUER, Jaroslava PLOMEROVA

Achauer, U. (6-01): *"What is the lithosphere-asthenosphere boundary – a quest for information"*
~~Artemieva, I. (6-02): *"Defining the LAB: semantics versus physics"*~~ (cancelled)
Plomerova, J., Babuska, V. (6-03): "European LAB constrained from seismic anisotropy"
Jung, S. (6-04): *"The nature of the asthenosphere-lithosphere boundary – constraints from high precision multi-isotope (Sr, Nd, Pb, Hf, Os) and HFSE (Zr-Nb-Ta-Hf) data*"

3:20 p.m. Session: "Mantle Dynamics and Plate Architecture Beneath North Africa"
Chair: Carlos GARRIDO

Garrido, C.J., Bodinier, J.L. (7-01): *"MeDyna – Mantle Dynamic and Plate Architecture Beneath North Africa"*
Hidas, K. (7-02): *"Deformation and melt localization in the subcontinental lithospheric mantle: a case study from the Ronda peridotite massif, Spain"*
Marchesi, C. (7-03): *"Trace element and Sr-Nd-Pb isotopic compositions of Cr-rich pyroxenites from the Ronda massif (Southern Spain): geodynamics implications for the westernmost Mediterranean in Cenozoic time"*

4:20 p.m. Coffee Break and Poster Session (for Details, see pages 4 and 5)

Friday, 8 Oct. 2010

9:00 a.m. Session: „The Unconventionals"
Chair: Hans-Martin SCHULZ

Littke, R., Krooss, B., Uffmann, U.K., Schulz, H.M., Horsfield, B. (11-01): *"Unconventional fossil fuels in Germany - overview and research perspectives"*
Doornenbal, H. (11-02): *"An overview of unconventional gas in The Netherlands"*
Moretti, I,, Vially, R., Bessereau, G. (11-03): *"Shale gas in France: source rocks and their maturity in French sedimentary basins"*

10:00 a.m. Session: "Probing Subduction Zones"
Chairs: Philippe AGARD

Agard, Ph. (3-01): *"Petrogeodynamics of HP-LT rocks: state of the art and application to processes along the subduction channel"*

10:20 a.m. Coffee Break

10:50 a.m. Session: "Continental Collisional Orogens and Deep Subduction"
Chairs: Larissa DOBRZHINETSKAYA, Wali FARYAD

Dobrzhinetskaya, L. (2-01): *"Frontiers in Ultra-High Pressure Metamorphism researches"*
Jahn, S. (2-02): *"Fluids under extreme conditions of pressure and temperature: insights from ab initio molecular dynamics simulations" – INVITED*
Nagel, T. (2-03): *"Metamorphic Diamonds and multiple regional high-pressure and ultra-high pressure events in the Rhodopes" - INVITED*
Faryad, S. W. (2-04): *"Significance of garnet peridotite and garnet clinopyroxenite studies for understanding deep subduction in the Moldanubian zone of the Bohemian Massif"*
Nita, B., Malinowski, M., Dobrzhinetskaya, L., Perchuc, E. (2-05): *"Anomalous mantle beneath collisional orogen of the Alps and its mineralogical interpretation" – INVITED*

12:30 p.m. Closing Session

1:00 p.m. End of Meeting

ILP's Second Potsdam Conference, 6-8 Oct. 2010

Poster Session

Korjenkov A.M., Abdieva S.V., Morozova E.A., Vakhrameeva P.S. (P1-01): *"Unknown historical earthquakes in north-west of the Issyk-Kul Lake region, western Tien Shan"*

Li, Z., Yang, J., Li ,T. (P2-01): *"Helium isotopic composition of the eclogites from the Lasha Terrane, Tibet: Information from deep mantle"*

Shirzaei, M., Walter, T. R. (P2-02): *"Volcanic and tectonic deformation monitoring in central Alborz, northern Iran, using advanced InSAR time series"*

Liu, F., Gerdes, A. (P2-03): *"Differential subduction and exhumation of crustal slices in the Sulu HP-UHP metamorphic terrane"*

Nahodilová, R., Faryad, S. W., Dolejš, D., Tropper, P., Konzett, J. (P2-04): *"High-pressure partial melting of the Moldanubian felsic granulites in the Bohemian Massif"*

Okrostsvaridze, A., Tormey, D., Bluahsvili, D. (P2-05): *"Ascent Distance of Anatectic Granitoid Melts in Collisional Orogens: The Greater Caucasus"*

Bakun-Czubarow, N., Dobrzhinetskaya, L., Jung, H. (P2-06): *"Garnet peridotites with microtextural memory of UDO within Bohemian Massif - their significance for mantle dynamics and terrane structure of Central European Variscides"*

Abratis, M., Brey, G., Viereck-Goette, L. (P6-01): *"Age and textural anisotropy of the SCLM derived from studies on xenoliths of the Central European Cenozoic Igneous Province (CECIP)"*

Babuska, V., Plomerova, J. (P6-02): *"Continental mantle lithosphere as a patchwork of micro-plates with their own pre-assembly 3D seismic anisotropy signature"*

Frets, E. (P7-01): *"Preliminary structure of the Beni Bousera peridotite massif, Northern Morocco"*

Konc, Z. (P7-02): *"Nature of the lithospheric mantle beneath SE Iberian Volcanic Province inferred from alkaline basalt hosted mantle xenoliths"*

Kourim, F., Alard, O., Bendaoud, A., Bodinier, J.-L., Bosch, D., Dautria, J.-M., Demouchy, S., Kienast, J.-R., Ouzegane, K., Tommasi, A., Vauchez, A., Yahiaoui, R. (P7-03): *"Lithosphere architecture and mantle dynamics underneath the Ahaggar volcanic swell: a view from xenoliths"*

Artemieva, I.M., Thybo, H. (P8-01): *"An Overview of Structure and Evolution of the Lithosphere in the North Atlantic Region"*

Baristeas, N., Anka, Z., di Primio, R., Rodriguez, J. F., Marchal, D., Vallejo, E. (P9-01): *"Seismo-Stratigraphic Analysis and Characterization of Hydrocarbon Leakage Indicators in the Malvinas Basin, Offshore Argentine Continental Margin"*

Hartwig, A., Boyd, D., Kuhlmann, G., Adams, S., Campher, C., Anka, Z., Di Primio, R., Albrecht, T., Singh, V. (P9-02): *"Characterization of Hydrocarbon Generation and Migration Dynamics Based on Seismic Interpretation and Basin Modeling: an Integrated Study of the Orange Basin, South Africa"*

Ostanin, I., Anka, Z., Di Primio, R., Skeie, J. E. (P9-03): *"Identification of a large polygonal-fault network in the Hammerfest Basin: implications on migration and leakage of hydrocarbons in the South Western Barents Sea"*

Alberico, I., Petrosino, P., Maglione, G., Armiero, V., Bruno, L., Lirer, L., Dal Piaz, A. (P10-01): *"Tools for a better hazard management at Campi Flegrei volcanic field"*

Pasquarè, F.A., Tormey, D.,Vezzoli, L., Okrostsvaridze, A., Tutberidze, B. (P10-02): *"Mitigating the consequences of extreme events on strategic facilities: Evaluation of volcanic and seismic risk in the Caspian oil and gas pipelines in the Republic of Georgia"*

Balic-Zunic, T., Jakobsson, S. P., Garavelli, A., Mitolo, D., Jónasson, K., Acquafredda, P., Morten Jølnæs Jacobsen, M. J. (P10-03): *"Mineralogy of encrustations from the recently and presently active Icelandic volcanoes"*

Bayraktutan, M. S. (P10-04): *"Environmental and social impacts of volcanic-geothermal activities in eastern Anatolia, Turkey"*

Poster Session (continued)

Corazzato, C., Tibaldi, A., Cavallo, A., Bonali, F., Lanza, F., Nardin, A. (P10-05): *"Plio-Quaternary kinematics and geometry of the Calama-Olacapato-El Toro fault zone across the Puna Plateau, Argentina"*

Paguican, E.M.R, Lagmay, A.M.F, van Wyk de Vries, B., Quina, G. (P10-06): *"Revisiting the historical debris avalanche deposit at the footslopes of Iriga Volcano, Philippines"*

Santo, A.P., Corselli, C., Tessarolo, C., Tibaldi, A. (P10-07): *"The hidden volcanic hazard: the low-water submarine volcanoes of the Sicily Channel, Mediterranean Sea"*

Tibaldi, A., Bistacchi, A., Pasquarè, F. A., Rust, D. (P10-08): *"Magma migration below volcanoes: the Isle of Skye, Scotland, intrusive system revisited"*

Tormey, D.,Pasquarè, F.A., Vezzoli, L., Okrostsvaridze, A., Tutberidze B. (P10-09): *"Determination of Risk Response Measures for Strategic Facilities: Caspian Oil and Gas Pipelines in the Republic of Georgia"*

Bonali F.L., Tibaldi A., Cavallo A., Corazzato C., Lanza F., Nardin A. (P10-10): *"Elastic stress interaction between faulting and volcanoes along the Calama-Olacapato-El Toro fault zone, Central Andes"*

Cavallo, A., Nardin, A., Tibaldi, A., Corazzato, C., Lanza, F., Bonali, F. (P10-11): *"Relationship between structures, petrochemical features and hydrothermal alteration along the Plio-Quaternary Olacapato-San Antonio fault zone (NW Argentina)"*

Dogan, M., Dogan, A. U., Tibaldi, A., Yesilyurt-Yenice, F. I., Alaygut, D., Ozbay, S. S., Akkus, M., Tosun, S. (P10-12): *"Comprehensive Review of Pleistocene Volcanics of Italy Using Classical Geochemical-Petrological Discriminant Diagrams"*

Dogan, A. U., Dogan, M., Tibaldi, A., Kuleci, I. H., Dogruel, Z., Unsal, O., Senyurt, Y. Y. (P10-13): *"Comprehensive Review of Pleistocene to Recent Volcanics of Italy Using Classical Geochemical-Petrological Discriminant Diagrams"*

Kadirov, F.A., Gadirov, A.H. (P10-14): *"Model of Mud Volcano by Geophysical and Geodetic Data"*

Yesilyurt – Yenice, F. I. (P10-15): *"Mineralogical composition of Mt. Erciyes lavas to calculate with MELTS model"*

Viereck-Goette, L., Koch, M., Lepetit, P., Abratis, M. (P10-16): *"Mesothelioma epidemic in Cappadocia, Turkey – risk assessment by geological survey"*

International Lithosphere Program*

Annual Report 2010

Appendix

b) List of published papers

* The ILP-homepage informs about all aspects of ILP: http://www.scl-ilp.org/

List of published papers

TF II:

Abebe B., Acocella V., Korme T., Ayalew D. (2007) Quaternary faulting and volcanism in the main Ethiopian Rift. Journal of African Earth Sciences, 48, 115-124.

Acocella V. 2007. The importance of analogue models to define caldera architecture. In: Caldera volcanism: analysis, modelling and response (Marti J., Gottsmann J., eds.). Developments in Volcanology, Elsevier.

Acocella V., 2007. Understanding caldera structure and development: an overview of analogue models compared to nature. Earth Science Reviews.

Acocella V., 2008. Activating and reactivating pairs of nested collapses during caldera-forming eruptions: Campi Flegrei (Italy). Geophysical Research Letters, 35, L17304, doi:10.1029/2008GL035078.

Acocella V., 2008. Structural development of calderas: a synthesis from analogue experiments. In: Caldera volcanism: analysis, modelling and response (Marti J., Gottsmann J., eds.). Developments in Volcanology, Elsevier, 10, 285-311.

Acocella V., 2008. Transform Faults or Overlapping Spreading Centers? Oceanic ridge interactions revealed by analogue models. Earth and Planetary Science Letters, 265, 379-385.

Acocella V., Abebe B., Korme T., Barberi F., 2008. Structure of Tendaho Graben and Manda Hararo Rift: implications for the evolution of the Red Sea propagator in Central Afar. Tectonics, 27, TC4016, doi:10.1029/2007TC002236.

Acocella V., Funiciello R., 2006. Transverse systems along the Tyrrhenian margin of central Italy and their influence on volcanism. Tectonics, in press.

Acocella V., Neri M., 2008. Dike propagation in volcanic edifices: overview and possible developments. Tectonophysics, in press.

Acocella V., Neri M., Scarlato P. (2007) Understanding shallow magma emplacement at volcanoes: orthogonal feeder dikes during the 2002-2003 Stromboli (Italy) eruption. Poster presentation EGU meeting, Vienna (Austria), April 2007. Abstract volume pag. 182.

Acocella V., Vezzoli L., Omarini R., Matteini M., Mazzuoli R. (2007) Kinematic variations across Eastern Cordillera at 24°S (Central Andes): tectonic and magmatic implications. Tectonophysics, 434, 81-92.

Acocella V., Vezzoli L., Omarini R., Matteini M., Mazzuoli R., 2008. Kinematic variations across Eastern Cordillera at 24°S (Central Andes): tectonic and magmatic implications. Reply to the Comment. Tectonophysics.

Acocella V., Yoshida T. Yamada R., Funiciello F., 2008. Structural control on Late Miocene to Quaternary volcanism in the NE Honshu arc, Japan. Tectonics, 27, TC5008, doi:10.1029/2008TC002296.

Acocella, V; Funiciello, F., 2010. Kinematic setting and structural control of arc volcanism. EARTH AND PLANETARY SCIENCE LETTERS Volume: 289 Issue: 1-2 Pages: 43-53.

Acocella, V., 2007. Caldera types: How end-members relate to evolutionary stages of collapse. Oral presentation EGU meeting, Vienna (Austria), April 2007. Abstract volume pag. 181.

Acocella, V., 2010. Coupling volcanism and tectonics along divergent plate boundaries: Collapsed rifts from central Afar, Ethiopia. GEOLOGICAL SOCIETY OF AMERICA BULLETIN Volume: 122 Issue: 9-10 Pages: 1717-1728.

Acocella, V., 2010. Evaluating fracture patterns within a resurgent caldera: Campi Flegrei, Italy. Bulletin OF VOLCANOLOGY Volume: 72 Issue: 5 Pages: 623-638.

Acocella, V.; Funiciello, F., 2010. Kinematic setting and structural control of arc volcanism. Earth and Planetary Science Letters Pages: 43-53.

Andrade, SD; de Vries, BV., 2010. Structural analysis of the early stages of catastrophic stratovolcano flank-collapse using analogue models. BULLETIN OF VOLCANOLOGY Volume: 72 Issue: 7 Pages: 771-789.

Andreozzi, GB; Ballirano, P; Gianfagna, A, et al., 2010. Title: Structural and spectroscopic characterization of a suite of fibrous amphiboles with high environmental and health relevance from Biancavilla (Sicily, Italy). AMERICAN MINERALOGIST Volume: 94 Issue: 10 Pages: 1333-1340.

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Apuani T., Corazzato C., Tibaldi A., 2006. Evaluation of volcano flank deformation and stability by numerical modelling of magma injection along the Sciara del Fuoco (Stromboli, Italy). Rock Mechanics and Rock Engineering.

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Bastero C.F., Lagmay A.M F., 2006. Estimating SiO2 content of lava deposits in the humid tropics using remotely sensed imagery. Journal of Volcanology and Geothermal Research, 151 (4), 357-364.

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Article in Springer volume: F. Roure, S. Cloetingh, M. Scheck-Wenderoth, P. A. Ziegler, 2010: Achievements and challenges in sedimentary basin dynamics. A review. In: New Frontiers in Integrated Solid Earth Sciences. Ed.: Cloetingh, S.; Negendank, J.Dordrecht [u.a.] : Springer, 2010. 145-233.

Special issue of the Journal of Marine and Petroleum Geology: "New results on Basin Dynamics" with guest editors Magdalena Scheck-Wenderoth, Ulf Bayer, Francois Roure, Maarten P. Corver is in the phase of finalisation.

Special issue of Tectonophysics in the aftermath of the successful EGU session 2010 is in preparation with submission deadline November 30, 2010.

Special Issue of the Arabian Journal of Geosciences (with 11 papers presented in Abu Dhabi), to be released in December 2010 (see editorial attached).

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International Lithosphere Program*

Annual Report 2010

Appendix

c) Task Force reports and outlooks

* The ILP-homepage informs about all aspects of ILP: http://www.scl-ilp.org/

Report on International Workshop on Geodynamic Evolution, Tectonics and Magmatism of the Central Asian Orogenic Belt and pre-Workshop field excursion to Gorny Altay, Russia

held on June 20-30, 2010 in Novosibirsk, Russia (http://altay2010.igm.nsc.ru)

This Workshop and pre-workshop field trip were organized by the Institute of Geology and Mineralogy, Siberian Branch, Russian Academy of Sciences (SB RAS) and co-sponsored by the Presidium of the Siberian Branch of the Russian Academy of Science (SB RAS), Centre for Russian and Central EurAsian Mineral Studies (CERCAMS), and Task Force 1 (ERAS) of the International Lithosphere Program (ILP).

The Institute of Geology and Mineralogy of the Russian Academy of Sciences, Siberian Branch (SB RAS), in Novosibirsk, in cooperation with the Presidium of the SB RAS, the International Lithosphere Program (ILP) Task Force 1 (ERAS) and CC-1/4 Project Topo Central Asia, and the Centre for Russian and EurAsian Mineral Studies (CERCAMS), joined as organizers for an International Workshop on Geodynamic Evolution, Tectonics and Magmatism of the Central Asian Orogenic Belt (CAOB) in Novosibirsk on June 29-30, 2010. This was preceded by a field excursion to the Gorny Altay in SW Siberia during June 20-28, 2010.

The main goal of the Workshop was to discuss the general evolution of the CAOB with special emphasis to the problems of continental growth, evolution of palaeo-oceans and active continental margins, collisional tectonics and metallogeny, based on results of previous field investigations and laboratory research. The Russian scientists demonstrated the late Neoproterozoic to Palaeozoic evolution of the Russian Altay terrane and, together with the international participants, discussed up-to-date models of ocean closure, continental accretion/assembly and intracontinental orogeny.

The field excursion attracted eighteen participants from 8 countries, namely Germany, England, Japan, China, France, Czech Republic, Poland and Russia. The excursion included en-route and camp-based field observations of the major geological structures of the Gorny Altai - Middle Palaeozoic suture-shear zone which separates the Siberian and Kazakhstan-Baikal continents. The Participants studied 1) units of a late Neoproterozoic-Cambrian island-arc, an accretionary and active margin, an Ordovician-Silurian passive margin, and the Devonian active margin of the Siberian continent; 2) the exotic Altay-Mongolian terrane; and 3) late Palaeozoic syn- and post-collisional magmatic and metamorphic rocks as well as strike-slip and thrust faults. Field-based discussions were heated and fruitful and helped to integrate our knowledge about the geodynamic evolution of the Gorny Altay belt. The participants discussed the tectonics and geodynamics of the Russian Altay and recognized the necessity to launch a new international project in order to continue international collaboration in structurally complicated and not well studied areas of the Central Asian Orogenic Belt.

The participants made 29 oral and 9 poster presentations during the workshop within four scientific sessions: 1) Geodynamic evolution of the Central Asian Orogenic Belt and problems of continental growth: role of mantle plumes, Gondwana blocks and subduction-accretion belts; 2) Evolution of palaeo-oceans and active continental margins: sedimentary, oceanic, accretionary and island-arc complexes; 3) Collisional tectonics and geodynamics: orogenic and post-orogenic magmatism, suture-shear zones, strike-slip faulting; 4) Geodynamics and metallogeny. The concluding discussions were very engaged and touched such vital problems as too much speculation in the interpretation of analytical data, the necessity of field evidence for many currently available models, quality of data, etc. An important recommendation was to launch a new IGCP project with the tentative title “Continental construction of the CAOB compared to actualistic examples from the SW Pacific (Japan to Indonesia)”. Letters of support with expressions of interest to contribute can be sent to Dr. Inna Safonova inna03-64@mail.ru.

Mikhail Buslov, Chief of Laboratory of Geodynamics and Magmatism at the Institute of Geology and Mineralogy, Siberian Branch, Russian Academy of Sciences (SB RAS). Misha graduated with an MSc degree in Geology (1978) from Novosibirsk State University, obtained his PhD in Geotectonics (1988) from the Institute of Geology and Geophysics, SB AS USSR (Novosibirsk), and the DSc degree in Geodynamics and Geotectonics (1999) from the United Institute of Geology, Geophysics and Mineralogy SB RAS, Novosibirsk. During more than 35 years he undertook extensive fieldwork in many regions of Russia (Altay, Tuva, East and West Sayan, Far East, Transbaikalia, etc.), Mongolia, Kazakhstan, Kyrgyzstan and Tajikistan and many other countries. His research field includes geodynamics, structural geology, active tectonics, metamorphic and igneous petrology, and geochronology; geological mapping of regional fault zones, accretionary complexes, collisional belts in Central Asia.

Inna Safonova, Senior Research Scientist at the Laboratory of Geodynamics and Magmatism of the Institute of Geology and Mineralogy SB RAS, Novosibirsk. Inna graduated with MSc (Hons.) degree in Geochemistry from Novosibirsk State University in 1987, and with MSc (Hons.) degree in Business Administration from the Russian Business Academy in 2004. She obtained her PhD degree in Geotectonics, Geodynamics, Petrology and Volcanology from the United Institute of Geology, Geophysics and Mineralogy, SB RAS, Novosibirsk, in 2005. She participated in, and initiated, many field missions in Russia, Kazakhstan, Kyrgyzstan and Japan (1995-2010). She joined the team of Associate Editors of *Gondwana Research* in May 2010. Her research fields include continental growth; magmatism and stratigraphy of paleo-oceans; magmatic geochemistry and petrology; timing, extent and sources of plume magmatism in Central Asia.

Photos from the field trip and workshop

Studying the first outcrop – Devonian active margin (left to right, 1st row): Alfred Kröner (Mainz), Keda Cai (Hong Kong), Vladimir Prelov (Moscow), Mikhail Buslov (Novosibirsk), Georgiy Biske (Sankt-Petersburg)

Kurai accretionary complex: discussing origin of greenstones (left to right): Inna Safonova (Novosibirsk), Jeremie Lehmann and Alexandra Guy (Strasburg)

The Chagan-Uzun ophiolite massive (left to right): Dmitry Gladkochub (Irkutsk), Andrei Prokopiev (Yakutsk) and Alfred Kröner (Mainz)

Friendly sunny morning in Altay

Opening ceremony of the conference:
Alfred Kröner (Mainz; left) and Reimar Seltmann (London)

Discussing problems of tectonic erosion:
Shigenori Maruyama (Tokyo)

ILP PROJECT TASK FORCE II

NEW TECTONIC CAUSES OF VOLCANO FAILURE AND POSSIBLE PREMONITORY SIGNALS

Final scientific report (2005-2009)

Leader: *Prof. Alessandro Tibaldi, University of Milan-Bicocca, Italy*
Co-Leaders: *Dr Alfredo F.M. Lagmay, University of the Philippines*
Dr Vera Ponomareva, Institute of Volcanology and Seismology, Russia
Dr Derek Rust, Brunel University, United Kingdom
Prof. Theofilos Toulkeridis, Universidad San Francisco de Quito, Ecuador

1. ORIGINAL MISSION

This project was originally aimed to:
- contributing to the understanding of the fundamentals of edifice failure in active and extinct volcanoes;
- promoting international coordination and integration for researches in a societal relevant issue;
- exchanging of know-how and data between European and non-European senior researchers;
- providing a training in research methods for young researchers and students.

During the five years of this ILP project, all these goals have been fully accomplished. In the next sections we will describe the more relevant results.

2. SCIENTIFIC WORK, METHODOLOGIES AND DISCOVERS

Tens of expeditions in the field have been carried out by the participants in this Task Force in European and non-European countries. The geology, structural geology and volcanological aspects of several volcanoes, as well as the geological-structural characteristics of their substrate, have been studied in different geodynamic environments. These two aspects give to the Task Force II project a full international and global perspective.
This is the schedule of the field works carried out:

- 2005

- May: work around Cotopaxi volcano, Ecuador;
- June: work at Stromboli volcano, Italy;
- August: work at the southwest branch of the Iceland rift system;
- October: work on the Cotopaxi volcano;
- November: work in the Philippines, at the Mayon volcano and along the Legaspi Fault belonging to the Philippine fault system.

- 2006

- May: Nisyros resurgent caldera, Greece;
- June: Stromboli volcano, Italy;
- August: close to Mayon volcano (Philippines) along the Legaspi Fault;
- September: Mt Hekla (Iceland) and southwest branch of the Icelandic rift system;
- October: Piton de la Fournaise, Reunion Island, Indian Ocean.

- 2007

- January-April: Stromboli volcano, Italy;
- May: Skye Island, United Kingdom;
- August: Siete Ciudades volcano, Sao Miguel Island, Azzorres, Portugal;
- November: Lassen Peak, USA;
- December: Copahue Volcano, Argentina.

- 2008

- March: Stromboli volcano, Italy;

- May: Little Chief Stock, USA;
- July: Skye Island, United Kingdom;
- August: Mt Etna volcano, Italy;
- October: Auvergne, France.

➢ 2009

- April: Mt Etna volcano, Italy;
- May: Little Chief Stock, USA;
- July: Wight Island, United Kingdom;
- September: Tien Shan, Kirghizistan;
- October: Puna Plateau, Argentina.

These volcanoes belong to different geodynamic environments. Volcanoes in complex setting are: Stromboli and Etna, Italy. Volcanoes in Andean setting have been studied in: Ecuador, Argentina, Chile. Volcanoes in Cordilleran setting are: Little Chief Stock, USA. In rift zones are: Skye Island, U.K., and several in Iceland. In intraplate setting we studied the Auvergne region, France. In oceanic setting we studied Reunion, Hawaii, and Azzorres. In arc/subduction setting we worked in: Greece, Kamchatka, Philippines, and Japan.

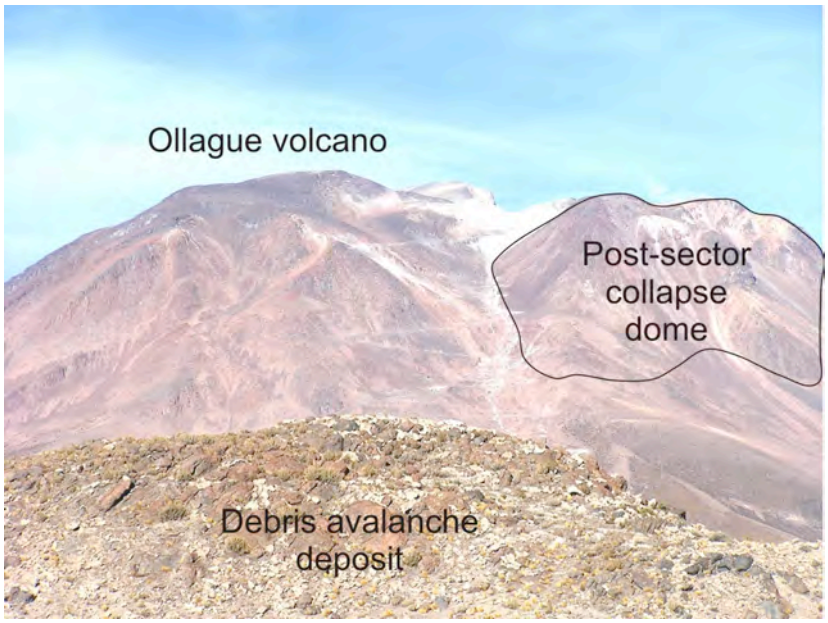

Figure 1. Example of an active volcano studied by the task Force II. The Ollague volcano is located along the Chile-Bolivia border, and shows a late Pleistocene sector collapse within which a new dome was constructed. The present activity is given by a tens-of-meters-high jet stream of gas escaping from the dome.

The studies carried out in these areas allowed to: 1) better understand the tectonics of the substrate around these volcanoes; 2) improve our knowledge on how volcanic and non-volcanic slopes deform under the gravity, magma, or tectonic stress field; 3) improve the understanding of the relationships between volcanism and tectonics; 4) give inputs to the assessment of local volcanic risk.

Moreover, in some of these areas, such as in Iceland and at Skye island (UK), it has been possible to reconstruct the geometry and structure of the magma feeding system below now-eroded volcanoes; this give insights to a better understanding of how volcanic plumbing systems work.

Field work has also been coupled with analogue modelling. Physical scaled modelling has been carried out in order to simulate deformations in volcanoes lying above different types of faults with different geometries and kinematics, as well as in volcanoes affected by calderas. The results have been compared also with numerical modelling. This was coupled with physical and geotechnical evaluation of

the rocks involved, in order to focus on two main topics: 1) 2D and 3D quantitative stability analysis of volcano slopes of some active volcanoes, such as for example Stromboli and Mt Etna (Italy); 2) reconstruction of the stress and strain 2D and 3D field around magma chambers produced by a combination of magma, gravity and tectonic forces, taking also into account the possible effect of different topographic surfaces. These latter results have been compared with field data, such as for example of the Skye Island, Cuillin intrusive complex (UK).

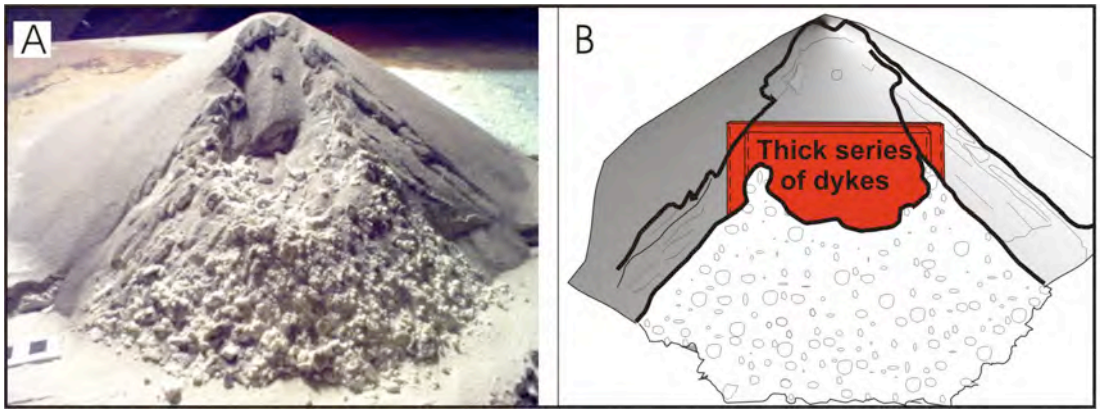

Figure 2. Example of scaled analogue modelling. A series of dyke intrusions have been simulated up to producing a sector collapse of the cone flank. In the forefront it can be seen the analogue of a debris avalanche deposit.

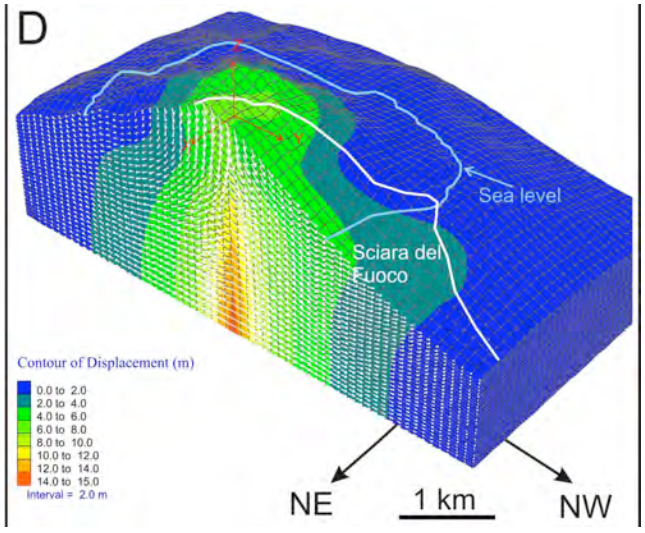

Figure 3. 3-D simulation by the FLAC numerical code of a dyke intrusion into the Stromboli volcano. The colours represent the deformation (in meters) induced in the cone flank by this intrusion. Note the asymmetry of the deformation that is larger on the NW cone flank, consistent with the Holocene landslide development that preferentially occurred on this flank.

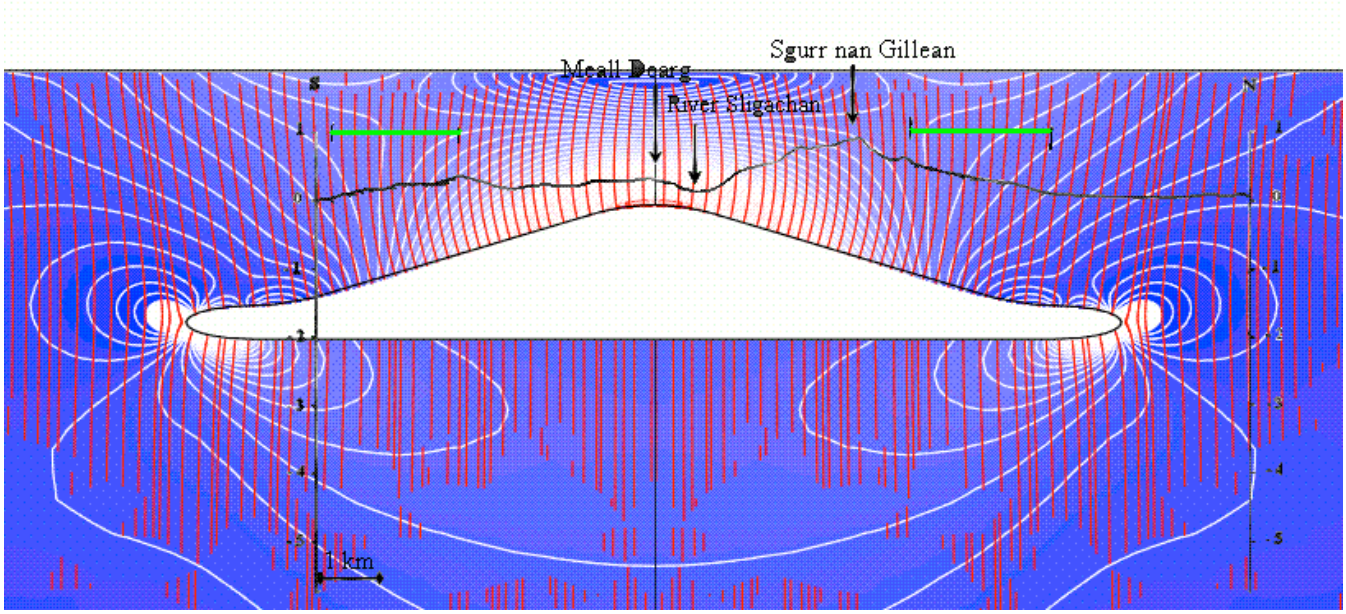

Figure 4. Numerical reconstruction of the directions of the greatest principal stress (sigma 1, red lines) induced by magma inflation into a laccolith-shaped magma chamber. These state of stress has been compared with field data on dykes and inclined intrusive sheets in order to better understand how magma propagates from magma chambers to the surface.

3. INTERNATIONAL COORDINATION AND INTEGRATION FOR RESEARCHES

The scientists of Task Force II consolidated the initiatives of collaborations on laboratory researches and field investigations in several different countries. As regards the country of origin of the various participants, the original total number of involved countries in Task Force II during the first year of the project (2005) was five, for a total of 13 actively participant researchers. These numbers increased during the five years reaching a total of 14 countries and 56 participating scientists (Argentina, Ecuador, France, Greece, Hungary, Ireland, Italy, Japan, Mexico, Philippines, Romania, Russia, United Kingdom, USA.

Other activities have been developed and expanded by launching a series of national and international research projects; in total 19 projects have been granted; here we mention just the last two new international programme (2009-2014) of collaboration on "Volcanology and applied geology" between the European Union and the USA, involving also teaching in the Earth Sciences on these themes. This programme has been successfully sponsored with a joint grant EU-USA of 900,000 Euro under the scheme Atlantis. Mobility of Earth Science students and professors is being improved thanks to this project under the EU coordination of A. Tibaldi and B. Van Wyk de Vries. This project is also aimed to give a dual Master degree with emphasis on the themes of this Task Force II. Another successful new project, granted by NATO with 250,000 Euro (coordinators D. Rust, A. Tibaldi and A. Koryenkov, 2009-2011), deals with the slope failures triggered by palaeo and modern earthquakes and is devoted also to find out the hazard posed by these collapses on artificial water reservoirs for hydroelectric energy production in Kirghizistan.

The initiatives to bring closer our research to the economic productive activities have been carried on by improving the relationships with industries and private societies dealing with the exploration and exploitation of geothermal energy and with environment and engineering geology.

4. EXCHANGE OF KNOW-HOW AND DATA

The dissemination of the results and exchange of know-how and data between European and non-European senior researchers have been achieved by the establishment of various sessions at international

meetings and the coordination of the joint meeting of ILP task forces held in Clermont Ferrand in October 2009.

A total number of 17 congress sessions in USA, Philippines, Cuba, Mexico, Austria, Italy, France and Norway have been organized, plus 2 International Workshops, namely: 1) "Exploring relationships between hydrothermal ore genesis, volcanism and tectonics at unstable volcanoes", under the aegis of ESF and ILP, Romania; 2) ILP joint task forces International Workshop, Clermont Ferrand, France, attended by up to 75 participants. The ILP logo has been always put forward, as well it has been presented as a co-sponsor at several important congresses, such as at EGU General Assembly, and at AGU Fall or Spring meetings, or under a NATO umbrella.

Several field workshops have also been organized, such as for example the one at Stromboli volcano of Figure 5.

Figure 5. The participants of the ILP fieldwork at Stromboli, June 2006

6. PUBLICATIONS

The number of publications on international peer reviewed journals arose from this project has been constantly increasing during the five years:

- 25 in 2005,
35 in 2006,
36 in 2007,
52 in 2008,
61 in 2009.

Moreover, we produced a special issue of the journal Tectonophysics in 2009, Vol. 471, entitled: “Understanding stress and deformation in active volcanoes”, Gudmundsson et al. (Eds.), 170 pages.
A list of the major papers is provided below.

Abebe B., Acocella V., Korme T., Ayalew D. (2007) Quaternary faulting and volcanism in the main Ethiopian Rift. Journal of African Earth Sciences, 48, 115-124.

Acocella V. 2007. The importance of analogue models to define caldera architecture. In: Caldera volcanism: analysis, modelling and response (Marti J., Gottsmann J., eds.). Developments in Volcanology, Elsevier.

Acocella V., 2007. Understanding caldera structure and development: an overview of analogue models

compared to nature. Earth Science Reviews.
Acocella, V., 2007. Caldera types: How end-members relate to evolutionary stages of collapse. Oral presentation EGU meeting, Vienna (Austria), April 2007. Abstract volume pag. 181.
Acocella V., 2008. Activating and reactivating pairs of nested collapses during caldera-forming eruptions: Campi Flegrei (Italy). Geophysical Research Letters, 35, L17304, doi:10.1029/2008GL035078.
Acocella V., 2008. Structural development of calderas: a synthesis from analogue experiments. In: Caldera volcanism: analysis, modelling and response (Marti J., Gottsmann J., eds.). Developments in Volcanology, Elsevier, 10, 285-311.
Acocella V., 2008. Transform Faults or Overlapping Spreading Centers? Oceanic ridge interactions revealed by analogue models. Earth and Planetary Science Letters, 265, 379-385.
Acocella V., Abebe B., Korme T., Barberi F., 2008. Structure of Tendaho Graben and Manda Hararo Rift: implications for the evolution of the Red Sea propagator in Central Afar. Tectonics, 27, TC4016, doi:10.1029/2007TC002236.
Acocella V., Funiciello R., 2006. Transverse systems along the Tyrrhenian margin of central Italy and their influence on volcanism. Tectonics, in press.
Acocella V., Neri M., 2008. Dike propagation in volcanic edifices: overview and possible developments. Tectonophysics, in press.
Acocella V., Neri M., Scarlato P. (2007) Understanding shallow magma emplacement at volcanoes: orthogonal feeder dikes during the 2002-2003 Stromboli (Italy) eruption. Poster presentation EGU meeting, Vienna (Austria), April 2007. Abstract volume pag. 182.
Acocella V., Vezzoli L., Omarini R., Matteini M., Mazzuoli R. (2007) Kinematic variations across Eastern Cordillera at 24°S (Central Andes): tectonic and magmatic implications. Tectonophysics, 434, 81-92.
Acocella V., Vezzoli L., Omarini R., Matteini M., Mazzuoli R., 2008. Kinematic variations across Eastern Cordillera at 24°S (Central Andes): tectonic and magmatic implications. Reply to the Comment. Tectonophysics.
Acocella V., Yoshida T. Yamada R., Funiciello F., 2008. Structural control on Late Miocene to Quaternary volcanism in the NE Honshu arc, Japan. Tectonics, 27, TC5008, doi:10.1029/2008TC002296.
Apuani T., Corazzato C., 2008. Numerical Model of the Stromboli Volcano (Italy) Including the Effect of Magma Pressure in the Dyke System. Rock Mechanics and Rock Engineering. In press, DOI 10.1007/s00603-008-0163-1.
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First year report of ILP Task Force 2010-2014:

Volcanoes and society: environment, health and hazards

***Leader Task Force**:*
Prof. A. Tibaldi, Department of Geological Sciences, University of Milan Bicocca, Italy;
***Co-Leaders:** Prof. A. U. Dogan, Dept. of Chemical and Biochemical Engineering, The University of Iowa, USA; Prof. B. Van Wyk de Vries, Lab. Magmas et Volcanos, Université Clermont Ferrand II, France; Dr D. Tormey, ENTRIX, Ca, USA.*

Following the original plan of this project, in the first year we accomplished the following goals:
1) field data collection at some of the volcanic key sites;
2) analogue and numerical modelling of the various phenomena;
3) start-up meeting with Leader and Co-Leaders of the present Task Force;
4) participation and organization of congress sessions under the aegis of ILP.
We are also on the way to prepare a web site dedicated to the project.

New scientific data

Regarding point 1), the various members of this Task Force II have been working on a series of volcanoes, most of which are active and thus show a hazard for the population. The studied active volcanoes are Mt. Etna and Stromboli (Italy), Pacaya (Guatemala), Piton de la Fournaise (Reunion Island), Iriga (Philippines), the Dominica Island (Lesser Antilles arc). Moreover, several extinct volcanoes have been studied in Cappadocia (Turkey), as well as some low-water submarine volcanoes in the Sicily Channel (Mediterranean Sea). The roots of volcanoes have been studied at the Isle of Skye, Scotland.
Special attention has been given to the study of the magma intrusive mechanisms. This issue has been developed by integration of field surveys with numerical and analogue modelling (point 2). Field data have been collected in eroded volcanic complexes, such as the Cuillin Complex at Skye, that preserve evidence of magma paths. These are represented by sheets, spanning from vertical dykes to inclined sheets and sills. We developed specific models representing magma propagation at the margin and above magma chambers under different boundary conditions represented by the different key sites distributed worldwide. By this way we started to determine individual parameters that control the magma feeding system, individuating common geometries and conditions that guide magma propagation towards the surface.
Special attention has also been given to the analysis of the conditions that trigger volcano lateral collapses. This has been addressed by studies on the deformation structures present on a series of key volcanoes, namely Mt Etna and Stromboli (Italy), and Iriga (Philippines), all of which are very prone to develop surface landslides as well as deep-seated slope deformations. The Task Force also investigated the effect of glacial melting on volcanic cone stability, as glaciated volcanoes in the temperate zones are expected to experience relatively rapid deglaciation and increased landslide/collapse behaviour is expected.
A great effort has been given to strength cooperation on the topic of minerals and human health. Integration of geological and mineralogical data with epidemiological medical evidence has been carried out in USA and Cappadocia. New researches on the distribution of the very dangerous erionite mineral started in northern Italy. International cooperation has been established: samples of rocks

bearing erionite have been sent to Iowa University where Prof. U. Dogan and his team studied the minerals.

Congress sessions of 2010 under the aegis of Task Force II

- EGU General Assembly, April 2010, Vienna, Austria, Session "Volcano tectonics", Chairmen: A. Gudmundsson (Germany), V. Acocella (Italy);
- ILP Potsdam meeting, October 2010, session "Volcanoes and society", Chairs: A. Tibaldi (Italy), A. U. Dogan (Saudi Arabia), M. Dogan (Turkey).

Congress sessions foreseen for 2011 under the aegis of Task Force II

- EGU General Assembly, April 2011, Vienna, Austria, Session "Volcano tectonics", Chairmen: A. Gudmundsson, V. Acocella;
- GEOMED 2011, Geological and Medical Sciences for a safer Environment, September 2011, ME2 – "Airborne Particulate Matters & Minerals", Conveners: Meral Dogan, F. Javier Huertas;
- GEOMED 2011, Geological and Medical Sciences for a safer Environment, September 2011, RA5 – "Medical Geology and Occupational Medicine", Conveners: Rodolfo Coccioni, Bianca Rimoldi, Fabio Tateo, Paolo Valera;
- GEOMED 2011, Geological and Medical Sciences for a safer Environment, September 2011, ET11 – "Mesothelioma inducing Minerals", Conveners: A. Umran Dogan.

Researchers and countries involved

Argentina
Dr Andres Folguera, Universidad de Buenos Aires.
Armenia
Prof. G. Bazikyan, Dept. Nat. Centre Oncology of Ministry of Health, Kanaker, Yerevan;
Dr K. Meliksetian, Inst. Geol. Sciences, Armenian Nat. Acad. of Science, Yerevan.
Azerbaijan
Dr Mirza Kazimov, Azerbaijan State Medical University, Baku;
Prof. Musa Mamedov, Geology Institute of Azerbaijan, Baku.
Croatia
Dr. Zdravko Spiric, Oikon Ltd. - Institute for Applied Ecology, Avenija Dubrovnik 6-8 10 020 Zagreb, zspiric@oikon.hr
Finland
Prof. Kai Savolainen, Finnish Institute of Occupational Health, New Technologies and Risks.
France
Prof. Benjamine Van Wyk de Vries, Universitè Blaise Pascal, Clermont Ferrand ;
Dr Vincent Cogliano, International Agency for Research on Cancer Monograph programme, World Health Organization, Lyon.
Georgia
Prof. L. Sturua, Non-infective Disease Epidemiology and Health Promotion Department, Tbilisi;
Dr P. Imnadze, National Center for Disease Control and Public Health of Georgia, Tbilisi;
Dr Simon Kuloshvili, Geological Institute, Tbilisi.
Hungary
Dr Ferenc Molnár, Department of Mineralogy, Eötvös Loránd University, Budapest.
Italy
Dr Bianca Rimoldi, Italian Worker's Compensation Authority (INAIL), Milan;
Prof. Alessandro Tibaldi, Dr Alessandro Cavallo, Dept. Geological Sciences and Geotechnologies, University of Milan Bicocca, Milan;
Dr Giuseppe Castellet e Dr Achille Marconi, Istituto Superiore della Sanità, Roma;
Dr Alba P. Santo, Dept. Earth Sciences, University of Florence;
Prof. A. Gianfagna, Dr Paolo Ballirano, Dr Giovanni B., Dept. Earth Sciences, Univ. of Rome "La Sapienza";

Dr Federico A. Pasquarè, Dept. Chemical and Environmental Sciences, University of Insubria, Como;
Dr Tiziana Apuani, Prof. Giorgio Pasquarè, Dipartimento di Scienze della Terra "A. Desio", Università di Milano;
Dr Valerio Acocella, Dipartimento di Scienze Geologiche, Università di Roma Tre, Roma;
Prof. Alberto Renzulli, Istituto di Vulcanologia e Geochimica, Università di Urbino.

Kirghizstan

Dr Andrey Koryenkov, Institute of Communication and Information Technologies, Bishkek.

Mexico

Dr Gerardo Carrasco-Núñez, Centro de Geociencias, Campus UNAM Juriquilla.

Philippines

Prof. Alfredo F.M. Lagmay, University of the Philippines, National Institute of Geological Sciences, Quezon City.

Romania

Dr Alexandru Szakács, Ioan Seghedi, Olimpiu Pop, Anna Paula Vinkler, Sapientia University, Dept. of Environmental Sciences, Cluj-Napoca.

Russia

Dr Alexander Strom, Institute of Geodynamics, Moscow;
Dr Vera Ponomareva, Institute of Volcanology and Seismology, Russian Academy of Sciences, Petropavlovsk-Kamchatsky.

Saudi Arabia

Prof. A. Umran Dogan, University of Saudi Arabia.

Turkey

Prof Meral Dogan, Department of Geological Engineering, Hacettepe University, Ankara.
Prof Y. Izzetin Baris, University of Hacettepe in Ankara, Turkey;
Prof Salih Emri, and Dr Murat Tuncer, Hacettepe University School of Medicine in Ankara.

United Kingdom

Prof Ken Donaldson, FRC Path ELEGI Colt Laboratory, Queen's Medical Research Institute, 47 Little France Crescent, Edinburgh EH16 4TJ;
Dr Tracey Jones, Respiratory Department, St Mary's Hospital, Parkhurst Road, Newport, Isle of Wight;
Prof. Derek Rust, Dr Nick Koore, University of Portsmouth;
Prof. Agust Gudmundsson, Department of Earth Sciences, Royal Holloway University of London, Egham, Surrey.

U.S.A.

Prof. Bill Rose, Michigan Technological University;
Prof. Eliza Calder, Buffalo University of New York;
Dr Dan Tormey, ENTRIX, Ventura, California.

List of publications

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Helmholtz-Zentrum
POTSDAM

GFZ · Postfach 60 07 51 · 14407 Potsdam

HELMHOLTZ-ZENTRUM POTSDAM
DEUTSCHES
GEOFORSCHUNGSZENTRUM
Telegrafenberg
14473 Potsdam

To the
International Lithosphere Program

Prof. Dr. Marco Bohnhoff
Geomechanik & Rheologie
Sektion 3.2

22. November 2010

bohnhoff@gfz-potsdam.de
Telefon: +49 (0)331 288-1327/1321
Telefax: +49 (0)331 288-1328

Outlook Task Force: From Microseismicity to Large Earthquakes: Studies Related to Seismic Hazard Assessment, Carbon Sequestration and Sustainable Resource Management

Dear Profs. Cloetingh and Oberhänsli,

the studies proposed within my ILP task force aim at investigating earthquakes over a very wide range of magnitudes extending from microseismicity with magnitudes as low as -2 to large damaging earthquakes, 9 orders of magnitude larger. Furthermore, Acoustic Emissions recorded during rock-deformation experiments in the laboratory will be considered. The planned studies will address fundamental scientific questions of earthquake physics at multiple scales as well as a number of previously-unaddressed scientific questions related to geologic sequestration of CO_2 and exploitation of sustainable hydrocarbon and geothermal energy resources as presented recently during my presentation at the ILP conference in Potsdam.
The analyses to be carried out for the entire range of scales will focus on the spatiotemporal evolution of hypocenters, the physics of faulting and the seismotectonic implications of the events, in order to develop quantitative models of the occurrence of seismicity in space and time. Natural seismicity along the North Anatolian Fault Zone (NAFZ) in NW Turkey will be investigated. Unique data sets acquired prior to and after the M>7 Izmit and Düzce 1999 earthquakes will be analyzed and related to on-fault recordings from the Istanbul/Marmara region where a major earthquake with high socio-economic impact is expected in the near future. High-precision hypocenter location methods for array-deployments will be further developed to identify activity patches along the relevant NAFZ segments. These methods will then also be applied to downhole seismic recordings from the SAFOD observatory in the San Andreas Fault in central California. Using Fault-Zone Head Waves the rupture directivity along the eastern Istanbul-Marmara seismic gap will be determined. Analysis of seismic

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activity patterns, fault kinematics and spatio-temporal variations of the local stress tensor will be performed with unprecedented detail. This will allow us to characterize and investigate asperities along the NAFZ as a major plate-bounding transform fault over a time period that includes two M>7 earthquakes. Induced microseismicity generated during fluid injection into reservoir rocks and sequestration of CO_2 will be investigated. Utilizing data from a number of projects in which the Stanford Rock Physics and Borehole Geophysics Project (SRB) is involved, will yield data sets with source-receiver distances as low as a few 100 m and allow to study events with magnitudes down to M= -2. These recordings permit us to trace injected CO_2 into depleted oil and gas reservoirs and saline aquifers where the feasibility of geologic sequestration of CO_2 is being considered. The relation between fluid transport processes and induced seismicity will be addressed analyzing Acoustic Emission data generated during deformation of porous sandstones in the laboratory in collaboration with the Physics and Application of Seismic Emission (PHASE) consortium at FU Berlin. The studies will be supplemented by analyzing state-of-the-art data sets of induced seismicity from industry-scale hydraulic fracturing experiments to refine existing theoretical models of man-made earthquakes. Newly developed hypocenter determination algorithms applied to data from both environments and analysis of source parameters will refine existing models relating earthquake occurrence to fluid-flow and tectonic loading processes. To compare the results obtained from both types of seismicity a systematic analysis of the rock failure processes focused on earthquake nucleation and migration in space and time in either environment will be performed allow addressing scaling-related objectives for earthquake processes covering the entire range from microseismicity to great earthquakes. With the data sets proposed to be examined in this ILP task force, bridging the gap between surface-based seismological

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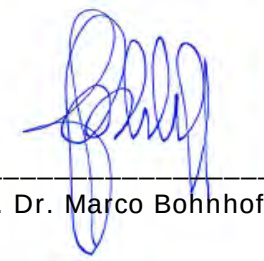
14473 Potsdam

field observations, downhole seismic monitoring during reservoir stimulation and small-scale brittle failure induced during rock deformation experiments in the laboratory becomes a realistic task.

I am looking forward to discuss the outcome of this research programme together with you soon!

Kind Regards,



_____
(Prof. Dr. Marco Bohnhoff)

October 31, 2010

2005-2009 REPORT on Task Force IV activity

Task Force IV: DEEP SUBDUCTION OF CONTINENTAL CRUST

Chair person – Larissa Dobrzhinetskaya, University of California at Riverside, USA

2005-2009 Special Volumes in the following International Journals:

(i) ***Journal of Metamorphic Geology:*** "Multidisciplinary approaches to ultrahigh-pressure metamorphism" v. 25, n. 2. doi:10.1111/j.1525-1314.2007.00697.x
Eds: L. Dobrzhinetskaya, & J.Gilotti.

(ii) ***Lithos*****:** "Ultrahigh pressure metamorphism: From Earth's interior to mountain buildings" **2009**, v.109, n.3-4. doi:10.1016/j.lithos.2008.11.003
Eds: L. Dobrzhinetskaya and Hannes Brueckner

(iii) ***Journal of Metamorphic Geology:*** "Ultrahigh pressure metamorphic terranes: mineral reactions, fluids, microstructures and deformation". **2009**, v.27. doi: 10.1111/j.1525-1314.2009.00855.x.
Eds: L. Dobrzhinetskaya, S.W. Faryad and J.-S. Yang

(vi) ***European Journal of Mineralogy*****: Thematic set:** "25 years of Ultrahigh pressure metamorphism", **2009,** v.21, n.5
Eds: Schertl, H-P., Perchuk, A., Cuthbert, S. & Gilotti, J.

Conferences:

Session convened at the following international forums:

(1) 2005-2009 American Geophysical Union and AGU Joint Assemblies

2005 American Geophysical Union, Session V53E: "Ultrahigh-Pressure Metamorphism: Multidisciplinary Approaches and Where to Go III: Petrology and Geochemistry." Fall meeting, San Francisco, CA, 5-10 December 2005.

2006 AGU Western Pacific Geophysics Meeting, Session: "Ultrahigh-Pressure Metamorphism and Crustal Melting I". Beijing, China, 24-27 July 2006.

2006 American Geophysical Union, Session V43F: "To What Depth Can Continental Crust be Subducted: Observations From Ultrahigh-Pressure Metamorphic Rocks, Experiments, and Numerical Modeling II." Fall meeting, San Francisco, CA, 11-15 December 2006.

2007 AGU Joint Assembly of AGU, Session V51B: "Deep Subduction Zone metamorphism and Rheology: Role of Fluid". Acapulco, Mexico, 22-25 May 2007.

2007 American Geophysical Union, Session V43E."A Retrospective and Prospective Look at Ultrahigh-Pressure Metamorphic Rocks II: New Developments. San Francisco, CA, 10-15 December, 2007.

2008 American Geophysical Union, Session V21: "Frontier of ultra-high pressure metamorphism and deep subduction: from atomic scales to mountains building". San Francisco, CA, 15-19 December, 2008.

2009 Joint Assembly of AGU, Session V04: "The role of UHP-HP metamorphism in the evolution of collisional orogenic belts." Toronto, Ontario, Canada. 24-27 May, 2009.

2009 American Geophysical Union, Session V54B and 43D: "New Insight into ultrahigh pressure metamorphism and rheology in collisional orogenic belts" San Francisco, CA, 14-18 December, 2009.

(2) 33^{d} Intentational Geological Congress, Oslo, Norway 6-14 August, 2008

2008 Symposium: "Ultrahigh pressure metamorphism and deep subduction" Oslo, Norway, 6-14 August 2008.

(i) Oral session: "UHPM: Minerals, microstructures and nanoscale observations".
(ii) Oral session: "UHPM: mineral reactions, geochemistry, thermobarometry and geochronology".
(iii) Oral session: "General topics of geology, tectonics and petrology of collisional orogenic belts: implication to UHP-HP metamorphic rocks"
(iv) Poster session on UHP metamorphism

(3) UHPM Workshops combined with International Eclogitic Conferences

2005 (i) The 7th International Eclogitic Conference (IEC-7), Session: "Diamonds from UHPM terranes." Seggau, Austria, 3-9 July 2005.

2007 (ii) International Eclogite Field Symposium Workshop: "Ultrahigh Pressure Metamorphism and Deep Subduction". Lochalsh, Scotland, 29 June - 7 July 2007.

2009 (iii) The 8th International Eclogitic Conference (IEC-8), Session: "Ultradeep subduction and exhumation – connections to mantle plumes and surface processes". Xining, Qinghai Province, China, 25 August-3 September 2009.

(4) Sessions at ILP conferences

2008 (i) International Lithosphere Program, Joint Task Forces meeting, Session 4: "Deep subduction and astenosphere-lithosphere interaction". Ensenada, Mexico, 21-26 September 2008.

2009 (ii) International Lithosphere Program, Joint Task Forces meeting, Session 3: "Tracking instabilities and heterogeneities in the upper mantle: constraints from geophysics, geochemistry, and numerical modelling; mantle petrology, rheology and deep geophysics". Clermont Ferrand, France, 5-7 October, 2009.

5. Educational Role of Task Force IV - International Schools for graduate students and early-mid career scientists

2007 (i) International School of Earth Sciences (I.S.E.S.) Session: "Ultrahigh Pressure Metamorphism and Deep Subduction". Odessa, Ukraine, 1-9 September 2007.

2009 (ii) Four active members of Task Force IV were invited as lecturers to International Summer School in Petrology "Eurispet". Theme: "High-pressure metamorphism and subduction zones": SPAIN, GRANADA: June 27 - July 5, 2009. (http://www.eurispet.eu)

Publications:

The active members have published **more than 100 peer-review papers** in *Nature, Science PNAS*, *Geology, Lithos, EPSL, Terra Nova, Journal of Metamorphic Geology*, *American Mineralogists, Contrib. Mineral Petrol., J. of Petrology, and others.*

Task Force IV provided financial support to 32 students and young scientists for their participation in International forums in period from August 2005 through August 2009.

Invited Talks and Guest Lectures have been given by active members in 20 Institutions in different countries.

October 31, 2010

ANNUAL REPORT on Task Force IV activity during 2010

Task Force IV: DEEP SUBDUCTION OF CONTINENTAL CRUST

Chair person – Larissa Dobrzhinetskaya, University of California at Riverside, USA

New Scientific Achievements
During report period there were several breakthrough discoveries that brought new knowledge to UHPM discipline that were not previously recognized. Below we report a few of them:

Discovery of two new microdiamond localities in Europe

(i) Sideronero area in Rhodope - Schmidt, S., Nagel, T.J., Froitzheim, N., 2010. A new occurrence of microdiamond-bearing metamorphic rocks, SW Rhodopes, Greece. European Journal of Mineralogy 22,189-198.
(ii) **Moldanobium Zone, Bohemian massif -** Naemura, K., Ikuta, D., Kagi, H., Odake, S., Ueda, T., Ohi, S., Kobayashi, T., Svojtka, M. and Hirajima, T., 2010. Diamond and other possible ultra-deep evidence discovered in the orogenic spinel-garnet peridotite from the Moldanubian Zone of the Bohemian Massif, Czech Republic. In: L. Dobrzhinetskaya et al. (Eds), Ultrahigh pressure metamorphism: 25 years after the discovery of coesite and diamond, Elsevier *(in press*).

Broader significance: These discoveries suggest that larger fragments of the continental crust were deeply subducted during Variscan orogeny, that it was thought before. It suggests that probably, some fragments of the continental crust are still stagnated elsewhere in the mantle beneath of the European continent. The chemical interaction of "fluid-rich" continental material with the drier mantle rocks can trigger partial melting, REE and compatible/incompatible elements re-distribution between ultramafic and felsic materials, and therefore changes in viscosity and rheology. These should draw up attention of geophysicits and plate tectonic modelliers working on the understanding of the nature of the regional seismic discontinuities in the European mantle.

<u>Sessions organized at following conferences:</u>

1. **AGU Western Pacific Geophysical Meeting-2010,** Session: V21B: "High-Pressure and Ultrahigh-Pressure Metamorphic Processes During Subduction and Collision I".May 22-25, Tapei, Taiwan

2. **EGU – 2010** Session: GMPV27/GD5.8 "New insights into the Deep Earth Part III: Ultrahigh pressure metamorphism and deep subduction: observations on natural rocks and experimental modeling" May 5-8, Vienna, Austria

3. **Goldschmidt Conference-2010** Session 8a: "Frontiers of ultrahigh pressure metamorphism: mineral reactions, isotope characteristics, phase transformations, fluids and solid state flow". June 13-19, Knoxville, Tennessee, USA

4. **International Mineralogical Association-2010** Session DE46: "Frontiers of ultrahigh-pressure metamorphism and deep subduction: From atomic scales to mountain building" August 22-27, Budapest, Hungary

5. **Fall AGU meeting-2010,** "Session V33: UHPM: 25 years after the discovery of coesite and diamond" VGP, December 13-17, San Francisco, USA

Special Volume

1. *Journal of Earth Sciences*. "From grain boundaries and mineral properties to understanding Earth dynamics". Springer *Eds: Dobrzhinetskaya L, Zhang J. & Irifune T , September, 2010*.

Book:

Ultra-high pressure metamorphism: 25 years after the discovery of coesite and diamond. Elsevier. *Eds: Dobrzhinetskaya L, Faryad W, Cuthbert S & Wallis S. (in press)*.

Publications:

The active members have published **more than 100 peer-review papers** in *PNAS*, *Lithos, EPSL, Terra Nova, Journal of Metamorphic Geology*, *American Mineralogists, Contrib. Mineral Petrol. and others.*

Zhang, J., Prakapenka, V., Kubo, A., Kavner, A., Green, H. W. and **Dobrzhinetskaya, L.F.**, 2010. Diamond nucleation from amorphous carbon and graphite in presence of COH fluids: *in situ* diamond anvil cell experiments. **In Book**: UHPM: 25 years after the discovery of coesite and diamond. Elsevier. (*In press*)

Smith, D. C., **Dobrzhinetskaya, L.,** Godard, G. and Green, H., 2010. Raman mappi ng of carbon micro-inclusions in zircon at Kumdy Kol, Kokchetav, Kazakhstan: evidence of metamictisation of diamond. **In Book**: UHPM: 25 years after the discovery of coesite and diamond. Elsevier. (*In press*)

Bruce, L.F., Kopylova, M.G., Longo, M., Ryder, J. and **Dobrzhinetskaya, L., 2010.** Cathodoluminescence of diamonds in metamorphic rocks. ***American Mineralogist***, *(in press)*.

Green, H. W., **Dobrzhinetskaya, L.F**. and Bozhilov, N.K., 2010. Alpe Arami story: triumph of the data over prejudice. ***Journal of Earth Sciences,*** 21:731-743.

Dobrzhinetskaya, L.F., Green, H. W., Takahata, N., Sano, Y., Shirai, K., **2010.** Crustal signature of $\delta^{13}C$ and nitrogen content in microdiamonds from Erzgebirge, Germany: Ion microprobe studies. ***Journal of Earth Sciences,*** Special issue, 21:623-634.

Ruskov, T., Spirov, I., Georgieva, M., Yamamoto, S., Green, H. W., C. McCammon, and **Dobrzhinetskaya, L., 2010.** Mössbauer spectroscopy studies of the

valence state of iron in chromite from the Luobusa massif of Tibet. ***Journal of Metamorphic Geology***, 28: 551-560.

Dobrzhinetskaya, L. and Wirth, R. **2010.** Ultradeep mantle rocks and diamonds in the light of advanced scientific technologies. In: ***New Frontiers of Integrated Earth***. Springer Netherlands. Eds. S. Cloetingh & J. Negendank, pp. 373-395

Five years long report:

Global and regional parameters of paleoseismology; implications for fault scaling and future earthquake hazard

ILP II-5, Task Force V

Paolo Marco De Martini and the Coordinating Committee

The regional organization of Task Force V:

Paolo Marco De Martini (INGV Rome-Italy) - Leader
Eulalia Masana (UN. of Barcelona-Spain) - contact for Europe/Mediterranean
Pilar Villamor (GNS Wellington-New Zealand) - contact for Southwest Pacific
Kenji Satake (GSJ/AIST-Japan) - contact for Japan and China
Suzanne Hecker (USGS Menlo Park-USA) - contact for North America
Carlos Costa (Un. Of San Juan-Argentina) - contact for South and Central America
Shmulik Marco (Un. Of Tel Aviv-Israel) - contacts with ESC and INQUA Paleoseismology groups

Daniela Pantosti (INGV-Italy), Kelvin Berryman (GNS-New Zealand), Bob Yeats (Oregon State Un.-USA), Yoshihiro Kinugasa (Tokyo Inst. Of Technology-Japan) - previous coordinators of ILP II-5

The project objectives:

a) To investigate the problem of earthquake source parameters at a global as well as regional scale.
b) To compare source parameters obtained by different methodologies (geodesy, geology, seismology and geophysics)
c) To provide evidence for linear or nonlinear relationship between average displacement and fault length for large dip slip and strike slip events, respectively.
d) To discuss implications derived from the above-mentioned studies for fault scaling and future earthquake hazard

The project tools:

- Organization of field-training courses and schools in paleoseismology, recognizing regional variation in surface fault rupture characteristics
- Proposition of workshops and conference sessions in international meetings focusing on the project subject
- Updating and maintenance of the Recurrence DB
- Seeking integration with the slip per event DB
- Updating and maintenance of the eq-geonet mailing list and of the project WEB page

In **2005** we sponsored two main scientific events, a brief description follows:

Hokudan Symposium and School, Japan 2005

The year 2005 started with a major Symposium that was in part organized and sponsored by this ILP Project. The Symposium was held in Hokudan, Japan between January 17-24, 2005. Thanks to the great organization of our Japanese colleagues over 150 participants representing 22 countries attended the Hokudan International Symposium and School on Active Faulting. Details are available at the web page: http://home.hiroshima-u.ac.jp/kojiok/hokudan.html

- Picture of the researchers attending the Hokudan Symposium

The meeting began on the tenth anniversary of the 1995 Hyogo-ken Nanbu (Kobe) earthquake, which killed nearly 6000 people and caused almost $115 billion in structural damage. The Symposium location was particularly appropriate because the town of Hokudan has built an impressive earthquake memorial park and seminar house dedicated to earthquake education. Centerpiece of the park is a 140-m-long structure erected over the surface trace of the Nojima fault. This structure protects the surface rupture and offset cultural features from erosion and human modification. The Seminar House has served to educate almost four million visitors since it first opened in April, 1998. It was in this spirit of education that the meeting participants convened to present and discuss developments in active fault research to fellow scientists and the Japanese public.
The principal aims of the 2005 symposium were to review the development of the studies on active faulting after the Kobe earthquake, and to promote advanced research in active tectonics and seismic hazard assessment in order to mitigate seismic hazards. Japanese post-Kobe national project for probabilistic seismic hazard analyses is now close to conclusion while the U.S. hazard maps were revised recently with more emphasis on geologic data and new ideas on next generation hazard maps are being developed. This was an extraordinary occasion to review and to discuss about the hazard assessment as well as the knowledge and techniques of active fault studies in wide context. It was clear

from the presentation and discussions that active tectonics research has progressed well in recent decades.
Another important theme of the Symposium was the knowledge transfer to the general public of the scientific achievements. This culminated with several public lectures and an open house where the public was invited to view the poster presentations of the symposium participants.
As part of the symposium and school, two field excursions were made: to the 1995 Nojima fault rupture and at the end of the meeting, to the Median Tectonic Line (MTL). Specifically the field trip after the symposium had two topics:
(1) Coseismic uplift of Muroto Peninsular associated with Nanakai Megathrust events.
(2) The most recent activity of the Median Tectonic Line around Matsuyama

The interactions in the field between specialists with different perspectives served as a reminder of the necessity for making field observations and discussing interpretations in order to establish a comprehensive international knowledge base. Although experience can be shared through international journals, many ideas and concepts are more completely understood and fully discussed in the field where the original observations are made. This is a critical understanding that absolutely needs to be taken under consideration for the future activities of the project.

Bulnay Field Conference, Mongolia 2005

In July 2005 we sponsored this international field trip and conference in Mongolia. During the 8 day long trip more than 35 scientists from several different countries took the opportunity to visit the 100 years old fault ruptures of the great Tsetserleg and Bulnay M>8 earthquakes and to give 25 talks that covered most of the active tectonics and earthquake geology related topics. The field trip was also a natural opportunity for Daniela Pantosti and Kelvin Barryman to present to a wide international scientific community the new ILP Project Coordinating Committee. It was clear from all the presentations and following discussion that the new subject of the ILP Project will positively attract several scientists and young researchers. The Coordinating Committee started to discuss about future activities and the way to involve in the discussion as many scientists as possible, taking in consideration also the already existing working group of INQUA.

In **2006** we worked on the organization of a field-training courses in paleoseismology, recognizing regional variation in surface fault rupture characteristics. At the moment we are in contact with the School of Geology, Mongolian University of Science and Technology and the EOST-Institut de Physique du Globe de Strasbourg that are working together at an international field trip and conference in Mongolia to be held in the summer 2007.

At the same time, for the July 2-13 **2007 IUGG Meeting in Perugia**, Italy, we already proposed and sponsored the following Interassociation Symposia and Workshop:

JS4 Paleoseismology, active tectonics and historical seismology

Session 1: Non-instrumental "seismometry"
Conveners: Gianluca Valensise (INGV - Italy), **Kenji Satake** (Active Fault Research Center, GSJ/AIST, Japan) Steven Ward (UC Santa Cruz, USA), Kuvvet Atakan (University of Bergen, Norway), Thierry Winter (BRGM, France)

Session 2: Global and regional parameters of paleoseismology; implications for fault scaling and future earthquake hazard
Conveners: **Kelvin Berryman** (IGNS - New Zealand, k.berryman@gns.cri.nz), **Paolo M. De Martini** (INGV- Sezione Sismologia e Tettonofisica, Italy, demartini@ingv.it)

Session 3: New and "traditional" paleoseismological approaches: a contribution to the understanding of earthquake recurrence
Conveners: David P. Schwartz (USGS, Menlo Park, USA, dschwartz@usgs.gov), **Daniela Pantosti** (INGV- Sezione Sismologia e Tettonofisica, Italy, pantosti@ingv.it)

All are sponsored by IASPEI - IAGA - **ILP**

In **2007** we worked on the organization of a field-training courses in paleoseismology, recognizing regional variation in surface fault rupture characteristics. In particular, we collaborated in the organization of the "**50th Anniversary Earthquake Conference Commemorating the 1957 Gobi-Altay Earthquake**" held in Ulaanbaatar, Mongolia, 25 July-8 August 2007.

- Picture of the researchers attending the Conference along the 1957 surface earthquake rupture

The International Lithosphere Program TF V, sponsor of the conference, covered the expenses (as a Scholarship) for some young researchers or students who participated to the field conference along the surface rupture of the Gobi-Altay earthquake (December 4, 1957; Mw=8.1). All the information about this initiative can be found at http://www.rcag.url.mn/seis/index.html, where a specific page related to the ILP scholarships exists.
Moreover, we decided to sponsor a professional videographer (extremely good and creative editor, too) to video all of the formal presentations in Ulaanbaatar and continue with a video of the field activities. The result would be a DVD with a permanent record of this workshop. The opportunities to use it would be limitless: each participant would receive a copy; there would be a record of the formal presentations (with slides) for the Mongolians, and for students of Mongolian tectonics worldwide; field observations and discussions would be recorded, along with interviews and thoughts of key scientists; the DVD could be put on any number of websites and could serve as a very visual primer on strike-slip faults for use by students and other professionals.
At the moment ILP-TF V is in contact with the School of Geology, Mongolian University of Science and Technology and the EOST-Institut de Physique du Globe de Strasbourg to finalize this video-project.

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ШИНЖЛЭХ УХААНЫ АКАДЕМИ
ОДОН ОРОН, ГЕОФИЗИКИЙН СУДАЛГААНЫ ТӨВ
Research Centre of Astronomy and Geophysics of the Mongolian Academy of Sciences

Ulaanbaatar - 51
P.O.Box - 152
MONGOLIA

№ 14

Fax : 976-11-455204
Tel : 458849, 480331

16 February 2007

Dear Paolo Marco De Martini

On behalf of the Research Center of Astronomy and Geophysics of Mongolian Academy of Sciences I would like to express to you our thanks for your kind financial support to the Commemorating 50 anniversary field conference of Gobi-Altai earthquake-2007. As discussed in previous letters and emails we will spend your 5000 Euros in order for young researchers and students to participate to our field conference.

Be sure that it is a great support for foreign and Mongolian young scientists who are going to participate to this field conference. Thanks to the ILP financial support they will have a good opportunity to be amongst world famous professors and to learn from them.

All applicants who get the ILP financial will wear colorful t-shirt and cap with the ILP logo paying respects to you.

I would like to thank you again for your kind support to our Center. I am sure that your sponsoring to our conference will be the beginning of a successful cooperation.

Director B.Bekhtur

Chairman of Commemorating 50 anniversary
field conference of Gobi-Altai earthquake-2007.

- Letter of the Conference Chairman to ILP

At the same time, during the July 2-13 **2007 IUGG Meeting in Perugia**, Italy, we proposed and sponsored the following Inter-association Symposia and Workshop:

JS4 Paleoseismology, active tectonics and historical seismology

Session JSS004: Non-instrumental "seismometry"
Conveners: Gianluca Valensise (INGV - Italy), **Kenji Satake** (Active Fault Research Center, GSJ/AIST, Japan) Steven Ward (UC Santa Cruz, USA), Kuvvet Atakan (University of Bergen, Norway), Thierry Winter (BRGM, France)

Summary: One of the outstanding issues in modern seismic hazard assessment practice is the comparison of the earthquake record with the geologic and geodetic evidence for ongoing tectonic strain. The correct estimation of past earthquakes on the one hand and

of geologic and tectonic parameters on the other hand forms the basis for assessing the maximum credible earthquake, the size of impending earthquakes, and the expected rate of earthquake production in any given region. Significant over- or under-estimations of the earthquake potential may derive from such diverse conditions as source complexity during historical earthquakes, poor assessment of fault size, dynamic fault interaction, failed identification of active fault trends, and aseismic creep.
This session intends to draw on scientists from different lines of expertise who are willing to cross conventional disciplinary boundaries and compare their approaches, results and residual uncertainties. We especially welcome contributions from these areas, or contributions that combine them into unconventional schemes:
- quantification of the historical earthquake record;
- quantification of the geologic record, including field studies of cumulative tectonic strain and the development of fault segmentation schemes;
- partitioning of geodetically-derived strain onto individually identified or areal active tectonic structures.
Papers are expected to emphasize the impact of the proposed results or approaches in the improvement of i) the understanding of the seismic cycle of major faults, and of ii) mid- to long-term seismic hazard estimates.

Session JSS005: Global and regional parameters of paleoseismology; implications for fault scaling and future earthquake hazard
Conveners: **Kelvin Berryman** (IGNS - New Zealand, k.berryman@gns.cri.nz), **Paolo M. De Martini** (INGV- Sezione Sismologia e Tettonofisica, Italy, demartini@ingv.it)

Summary: This session deals mainly with the integration of earthquake and fault rupture parameters across the seismological/geological/geophysical boundaries exploring the difference in scaling between large and small earthquakes. Another interesting aspect we would like to discuss concerns the evidence for linear or nonlinear relationship between average displacement and fault length for large dip-slip and strike-slip earthquakes. These have been the topic of considerable debate in the last years and we hope that the contributions to the session will advance our knowledge at both global and regional scales.
The session includes, but is not restricted to, the following topics:
- relationships between paleoseismological parameters (surface rupture length and average surface displacement) and earthquake magnitude estimates;
- comparison of paleoseismological parameters obtained from the pre-instrumental epoch as against modern earthquakes studies;
- comparison of source parameters obtained by different methodologies (geodesy, geology, seismology and geophysics).
We particularly welcome contributions based on results from fieldwork, high-resolution geophysical measurements, remote sensing studies and analogue models. We also encourage presentations dealing with problems of under- or over-estimation of earthquake magnitude resulting from spatial variability of slip and scarp degradation processes at the surface.

Session JSS006: New and "traditional" paleoseismological approaches: a contribution to the understanding of earthquake recurrence

Conveners: David P. Schwartz (USGS, Menlo Park, USA, dschwartz@usgs.gov), **Daniela Pantosti** (INGV- Sezione Sismologia e Tettonofisica, Italy, pantosti@ingv.it)

Summary: Paleoseismology is now a well-established discipline whose major goal is the identification and dating of past earthquakes in the geological record. It provides the fundamental data for developing an understanding of the behavior of seismogenic faults in time and space and the primary recurrence information for seismic hazard assessment. Paleoseismlogy has evolved during the past 30 years and is now practiced worldwide. As the field moves into the 21st century there is recognition of the need to: develop longer earthquake chronologies, reduce uncertainties in recurrence times, and develop better knowledge of earthquake recurrence on sources that do not not easily lend themselves to traditional paleoseismic analysis (trenching).
We invite contributions on topics that include NEW:
-statistical analyses of paleoseimic recurrence data, particularly for correlating the occurrence of past events along faults ;
-approaches to identify paleoearthquakes on blind or remote (ie, subduction zone) earthquake sources and in logistically difficult settings such as urban environments;
-technologies that increase the length of the paleoseismic record and paleoearthquake chronologies at investigation sites on major faults;
-dating techniques of paleoearthquakes;
-approaches to quantify slip in paleoearthquakes for better estimates of paleo-earthquake magnitudes

A total of 60 contributions were presented and discussed.
All these sessions were sponsored by IASPEI - IAGA - **ILP**

In **2008** we worked on the organization of a special **South America Initiative** with the active participation of Carlos Costa.

Multinational Andean Project: Geoscience for Andean Communities, subproject: El Grupo de Trabajo en Neotectónica

Recognizing the need for the application of high quality geoscience information on landslides, earthquakes, and volcanoes in the Andean region of South America, the national geoscience agencies of Argentina, Bolivia, Chile, Colombia, Ecuador, Peru and Venezuela along with Canada, created the Multinational Andean Project: Geoscience for Andean Communities (MAP:GAC). In a collaborative effort, funds from the Canadian International Development Agency (CIDA) and the geological surveys of the eight member countries involved in the project were directed towards "contributing to improving the quality of life for peoples of the Andes by reducing the negative impact of natural hazards by providing updated and integrated geosciences and geospatial information on natural hazards for: 1) land use planning and, 2) natural hazard mitigation".

A part of the project focused on providing information and mapping seismogenic structures, as these contribute significantly to earthquake hazard assessments. The national geological survey formed a collaboration with the seismological surveys of Argentina, Bolivia, Ecuador and Venezuela as well as the Universidad Nacional de San Luis, Argentina. A working group "Grupo de Trabajo en Neotectónica (GTN)" was created to train personal from the geological surveys in neotectonic/ paleoseismological diagnostic techniques and to develop a web based tool to provide the public with available information. The GTN working group built on earlier maps of quaternary faults of the Andes published by the Project "Sismicidad Regional Andina" and the International Lithosphere Program (ILP-2) and recompiled information published thereafter. A total of ~ 530 structures with more than 1600 sections have been mapped. This new map is published online using topographic data as a background for user-friendly location of structures and is publicly available on the project's web tool GeoSemantica (http://can.geosemantica.net/). All structures are linked to report cards which contain a summary of all information available on each structure. The tool is designed to allow continuous updates by the project partners.

It is recognized that neotectonics/ paleoseismology is a relatively new discipline within the Andean countries and few structures have been studied to an adequate level of detail and many other quaternary structures remain unknown. As result, the GTN provided two further products to the Spanish speaking community: 1) a compilation of 32 quaternary deformation case studies in the Andean region, and 2) a neotectonic/ paleoseismologic glossary. (1) The compilation show case quaternary faults and folds from different tectonic and climatic setting. The intention is to train practicing geologist in recognizing seismogenic structures. (2) The glossary contains more than 300 terms and it intended is to enhance communication and understanding between sub disciplines like tectonics, structural geology, geomorphology, geochronology, geodesy, seismology, Quaternary geology and archaeology collaborating in neotectonics/ paleoseismology.

In **2009** we worked on the organization of a ESF Research Conference: **"Submarine Paleoseismology: the offshore search of Large Holocene Earthquakes"** with the active participation of Daniela Pantosti, to be held at UniversitŠtszentrum Obergurgl, Austria, 11-16 September 2010

The scope of the conference is to create a discussion platform and new synergic contacts among researchers that are already, or may become, involved in a new field of study: Submarine Paleoseismology. This conference is the first event ever on this subject and represents the official start and first international recognition to Submarine Paleoseismology. This new field of study is the merge and integration of the strength of two disciplines: paleoseismology, and marine geology. During the past years relevant scientists coming from both fields have underlined the need to broaden paleoseismology into the marine environment and a few local approaches have thus been attempted.
Successful examples of this come from the Marmara Sea, Oregon Coast, New Zealand, Japan and South Iberian margins. Submarine Paleoseismology represents a unique and powerful integration to the Holocene faulting and paleoseismicity knowledge already existing on land. Despite the limitation of not being able to work as we do in the traditional paleoseismological trenching onland, Submarine Paleoseismology has the advantage that (i) marine sedimentation is generally continuous in time and space; (ii) seafloor imaging and marine geophysical instrumentation allows us to explore extensive areas in a relatively short time, (iii) offshore regions are essentially free of human modification.
ILP II-5 TF V is discussing with the Conference Organizing Committee the best way to support with ILP funds the participation of young researchers and/or students.

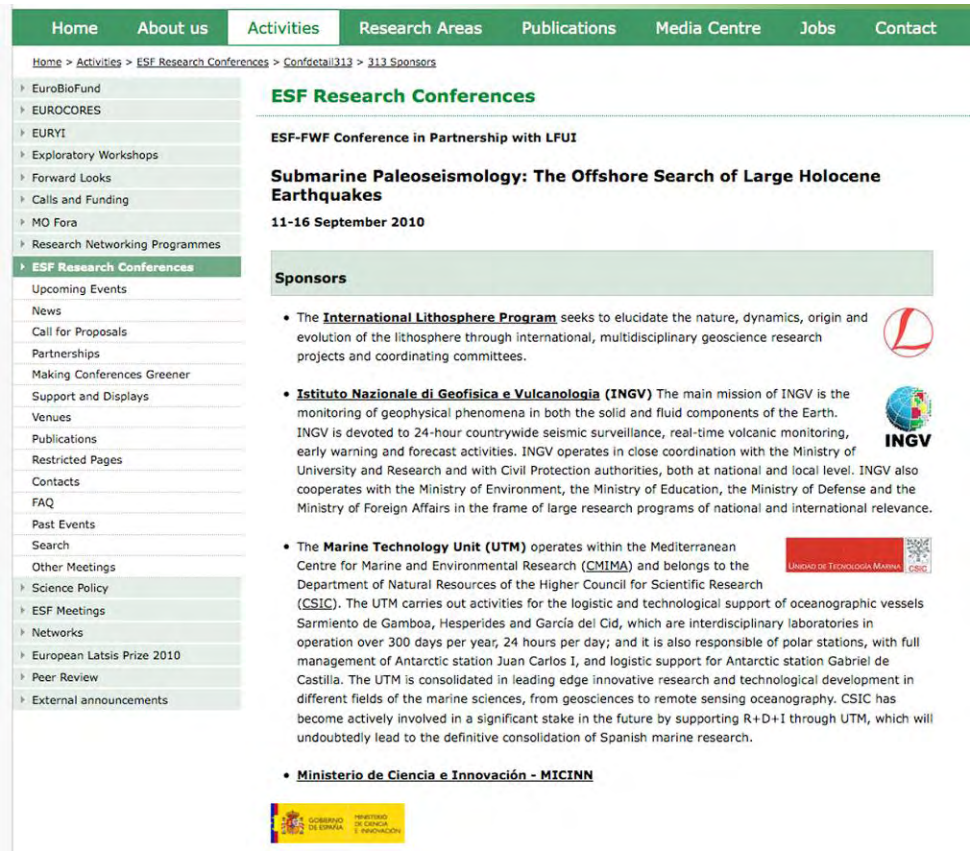
In **2010** we worked on the organization of an ESF Research Conference: **"Submarine Paleoseismology: the offshore search of Large Holocene Earthquakes"** with the active participation of Daniela Pantosti, to be held at UniversitŠtszentrum Obergurgl, Austria, 11-16 September 2010.
The total number of participants was 66 of which 26 invited speakers, 27 invited talks (30 minutes each) and 15 short talks (15 minutes each) were given by participants grouped in 6 sessions. A total of 52 posters were displayed during the conference.

- Picture of the researchers attending the ESF Research Conference with special glasses to see submarine 3-D images.

Submarine Paleoseismology ESF Conference lesson
The subaqueous environment has clear advantages with respect to the terrestrial one for the development of paleoseismological research that are:
(i) marine sedimentation is generally continuous in time and space, allowing for regional stratigraphic correlations and for the reconstruction of a complete record of events; (ii) seafloor imaging and marine geophysical instrumentation allows us to explore (at different degrees of resolution) extensive areas in a relatively short time; (iii) offshore regions are essentially free of human modification and of large settlements that prevent the full application of paleoseismology.
Possible disadvantages are related to:
A) the higher financial budget needed for the subaqueous research; B) the approaches to obtain all the information regarding the individual paleoearthquakes such as slip per event and age and thus, recurrence time and elapsed time, are still in the process of being strengthened and to be consistently tested.

Submarine Paleoseismology ESF Conference results

A) The best approaches to survey, investigate, and date subaqueous or coastal co-seismic and post-seismic effects of past earthquakes and tsunamis were analyzed and formalized; B) Most of the geological parameters of use for seismic hazard assessment can be derived also from sub-aqueous environments and thus that there is a true perspective for the future of this science; C) Some pioneering studies have already developed sub-aqueous paleoseismology although, only rarely, the results were used as input to seismic hazard assessment studies (new Zealand will soon); D) Subaqueous Paleoseismology can benefit of the incredible technological advancements developed during the past decade. This is true for the tools of use in marine geosciences but also for improvements in computer geoscience, geochronology, etc.



- Web page of the ESF Research Conference with sponsors.

Details on this ESF Research Conference can be found at
http://www.esf.org/activities/esf-conferences/details/2010/confdetail313.html

In **2010** we also worked in collaboration with Universidad Complutense de Madrid, Universitat de Barcelona (with the active participation of Eulalia Masana) and Instituto Geologico y Minero de Espana on the organization of the

First Iberian Meeting on Active Faults and Paleoseismology, to be held at Siguenza (Guadalajara) october 27-29, 2010.

- Picture of the researchers attending the Iberfault Meeting.

Main scientific points: a) Determining and characterizing the seimogenic sources in the Iberian peninsula is the key to obtain realistic seimic hazard values; b) Geological and particularly paleoseismological studies are needed to correctly quantify the seismogenic potential of individual faults and to estimate their probability of activity during time periods that are relevant to society.

- Web page of the Iberfault Meeting with sponsors.

Details on this Conference can be found at: **http://iberfault.org/index.html**

Subaqueous Paleoseismology

ILP II-5, Task Force V

Paolo Marco De Martini and the Coordinating Committee

There is a concentration of population in the coastal areas that is seriously threatened by major earthquakes and tsunamis that are generated along offshore faults, which are poorly known. Despite the limitation of not being freely able to hands-on observe, sample and measure the fault at its intersection with the Earth surface, working in the subaqueous environment has clear advantages as the continuous sedimentation, minimized erosion, very limited human modification, and the consequent possibility to image through geophysical techniques extensive areas.

Subaqueous paleosismology is the study of the timing, location and size of pre-historical earthquakes (Holocene or Quaternary, depending on the area we are studying) occurred under water (at sea, lakes or coastal areas). There are many evidences of seismic activity underwater in different tectonic environments, and these are represented by fault displacement and earthquake associated processes, such as submarine landslides, turbidity currents and tsunamis.
The survey methods in subaqueous paleoseismology are based on the most advanced methodological and technological developments in marine geosciences, covering different scales of resolution. Acoustic mapping techniques allow to identify the geomorphic evidence of active faults and to map fault traces along large areas relatively fast. When the swathbathymetric systems are installed in a remotely operated vehicle (ROV) or autonomous operated vehicle (AUV), which run near the seafloor, a cm-resolution comparable to the microtopography inland may be achieved, allowing to map the surface rupture of a given earthquake. Seismic imaging techniques allow to detect the stratigraphic evidence of seismic activity, such as folded and faulted reflectors and discontinuities, and may give a long temporal record of the fault activity (*i.e.*, slip rates may be more robust). In shallow water depth, very high-resolution seismic systems may get near to resolutions achieved by trenching on land, being able to detect the offset produced by a single event. In addition, survey grids may allow sub-surface "3D" mapping. Sediment sampling allows characterizing and dating sediment layers and mass transport deposits triggered during earthquakes.
Fault morphology and segmentation is well expressed underwater, as erosion is minimized and scarps can be better preserved. Examples of cross-cutting relationships are revealed in map view (*e.g.* offset channels for strike-slip faults) or in depth-section (*e.g.* faulted horizons for dip-slip faults). In very few cases (e.g. Marmara Sea and New Zealand), earthquake ruptures were identified and vertical and strike-slip components per event (*i.e.* coseismic slip) were obtained, as this is based on the ability to recognize and date individual event horizons (*i.e.* as in trenches onland). This is a topic for future research and technological development as it essentially depends on the vertical resolution of the underwater acoustic and seismic imaging methods.
Moreover, the off-fault studies, based on seismically triggered landslides, turbidites and tsunamites, may give information on earthquakes and allow obtaining recurrence

intervals of large magnitude earthquakes, essential for seismic hazard assessment. However, the use of mass transport deposits as paleoseismic indicators requires demonstrating that earthquakes are the most plausible triggering mechanism. Synchronicity tests are based on coeval turbidites that can be correlated among widely separated depositional areas, at least during Holocene when the sea level stabilized.

Nowadays Subaqueous Paleoseismology can benefit of the incredible technological advancements developed during the past decade. This is true for the tools of use in marine geosciences but also for improvements in computer geoscience, geochronology, etc.

Paleoseismic parameters derived from subaqueous on-fault studies as well as recurrence intervals (regional or related to an individual fault) derived from off-fault earthquake triggered underwater mass transport deposits should be taken into account in any future seismic hazard assessment.

Subaqueous paleoseismology has an enormous potential to develop worldwide and to provide important and essential input to seismic hazard assessment of coastal areas threatened by the effects of local and distant earthquakes.

Subaqueous Paleoseismology

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Subaqueous paleoseismology has an enormous potential to develop worldwide and to provide important and essential input to seismic hazard assessment of coastal areas threatened by the effects of local and distant earthquakes.

Report of the 2010 activities of the ILP Task Force on Sedimentary Basins

The activities of the task force included a session at the European Geosciences Union General Assembly 02 – 07 May 2010 in Vienna, Austria; participation in the ILP conference Potsdam 6 - 8 October 2010; organisation of the annual workshop, this year held November 7-12, 2010 in Tirana, Albania, and several publications.

EGU 2010

A very successful session “Basin Dynamics” GD2.1/SSP1.3/TS4.8 took place on Tuesday, 04 May (12 oral presentations and 40 posters, see Appendix 1)). The session was co-organized by the divisions of Geodynamics, Tectonics & Structural Geology and Stratigraphy, Sedimentology & Palaeontology, with Convener Magdalena Scheck-Wenderoth and Co-Conveners Francois Roure , Christophe Basile , Virginie Gaullier.

As in the years before, this session addressed the dynamics of sedimentary basins on different temporal and spatial scales and aims to bring together studies focussing on geodynamics, tectonics, sedimentology and geochemistry. Competition for oral sessions was particularly hard in this year and the conveners choose predominately young scientists as oral presenters. The Task Force Sedimentary Basins of the International Lithosphere Programme promotes the dialogue between researchers studying the basin fill with those investigating the deeper structure as well as with those developing numerical and analogue experiments of processes that take place in basins of different geo-tectonic settings. This session therefore was a platform for this type of exchange and combined basin-fill related research with concepts of deep lithospheric deformation and to evaluate the relationship between the two end members. We had contributions integrating data from different depth levels of the lithosphere as deep seismic sounding and analysis of the potential fields with observations from the shallower parts of the basin system as subsidence pattern, stress, vertical motions and active faulting. We welcomed contributions analyzing the interactions between deep earth and surface processes, i.e., thermicity, phase-transitions, fluid circulations and transfers, fluid-rock interactions, interactions between tectonics, erosion, sedimentation and climate. Furthermore studies yielding constraints on the variety of conceptual and quantitative models explaining the origin and evolution of basins in different tectonic settings were invited. The record of basins represents the archive of their dynamic history. Moving through different temperature and pressure conditions on their way from deposition to deep burial, sediments store the imprints of processes controlling this history. To assess the contributions resulting from different depth levels the interplay between processes affecting the lithosphere and crust and those controlling the fate of the sediment fill needs to be deciphered. Therefore the superposed signals of internal factors as the presence of a decoupling salt layer or migrating fluids and of influences induced by deeper levels as lithospheric thinning have to be considered separately but also set into context.

Second Potsdam ILP Conference, 6 - 8 October 2010: Solid Earth - Basic Science for the Human Habitat":

This workshop combined presentations of the different Task Forces active in ILP and the Task Force Sedimentary Basins contributed with 4 oral and 3 poster presentations. It proved an interesting platform and synergies were found especially with the new Task Force on “Circum-Arctic Lithosphere Evolution”.

Yearly workshop of the Task Force: 2010 in Tirana:

DYNAMICS and ACTIVE PROCESSES: the ALBANIAN NATURAL LABORATORY and ANALOGUES

Thanks to the help of the local organizing committee an excellent 6th workshop of the task force took place from November 7-12, 2010 in Tirana, hosted by the Polytechnic University of Tirana (PUTirana).

X participants from X countries have attended 3 days of conference (programme attached as Appendix 2), + one pre-conference field trip to the Mirdita Ophiolite + one post-conference field trip to Vlora and Saranda (Ionian Zone). Proceedings are to be published in 2011 in a special issue of the Italian Journal of Geosciences.

2010 Budget

Incomes:

Saved from the positive balance of the 2009 conference in Abu Dhabi:
10.313 Euros kept on the SGF account to cover the expenses related to the Abu Dhabi Proceedings (Springer volume, to be published in 2011)
4.000 Euros kept at IFP

2010 ILP support:
3200 Euros sent to the SGF account

Registrations:
7840 Euros (including 2750 Euros not yet recieved)

Expenses:

Travel grants:	2900 Euros
Catering (paid from IFP):	3146 Euros
Badges (paid from IFP):	156, 5 Euros
Field Trip:	3722 Euros
SGF (cost of website and %registrations):	784 Euros
Reimbursement of Mary Ford:	400 Euros
Total Expenses:	**11.106, 5 Euros**

Balance (surplus):

10.313 Euros (kept on SGF account for 2011 Springer volume-Abu Dhabi)

3240 Euros (11040 – 7800) on SGF account (including 2750 Euros not yet recieved)

697, 5 Euros (4000 – 3302, 5) still at IFP

Publications:

Special issue of the Journal of Marine and Petroleum Geology: "The link between deep and shallow processes in sedimentary basins" was printed in 2010 and contains 11 papers addressing the topic (see report 2009).

Article in Springer volume: F. Roure, S. Cloetingh, M. Scheck-Wenderoth, P. A. Ziegler, 2010: Achievements and challenges in sedimentary basin dynamics. A review. In: New Frontiers in Integrated Solid Earth Sciences. Ed.: Cloetingh, S.; Negendank, J.Dordrecht [u.a.] : Springer, 2010. 145-233.

Special issue of the Journal of Marine and Petroleum Geology: "New results on Basin Dynamics" with guest editors Magdalena Scheck-Wenderoth, Ulf Bayer, Francois Roure, Maarten P. Corver is in the phase of finalisation.

Special issue of Tectonophysics in the aftermath of the successful EGU session 2010 is in preparation with submission deadline November 30, 2010.

Special Issue of the Arabian Journal of Geosciences (with 11 papers presented in Abu Dhabi), to be released in December 2010 (see editorial attached).

Special volume of Springer (Regional series) to be published in 2011, including the second part of the Proceedings of the Abu Dhabi meeting.

Arab J Geosci
DOI 10.1007/s12517-010-0221-3

EDITORIAL

Lithosphere dynamics and sedimentary basins: the Arabian plate and analogues

François Roure · Magdalena Scheck-Wenderoth · Abdullah Gahnoog · Tim Pharaoh

The Task Force on Sedimentary Basins was initiated in 2005 on behalf of the International Lithosphere Programme (ILP), in order to (1) assist the international community of Earth Scientists involved in the study of asthenospheric and deep lithospheric/crustal processes to exchange views with colleagues involved in the study of sedimentary basins, and to promote collaborative projects integrating surface and deep processes for regional case studies, (2) promote yearly international meetings involving colleagues from universities, research institutes as well as the industry, and (3) provide support for young scientists (Ph.D. and post-docs) to participate in the activities of this international network.

This special issue of the Arabian Journal of Geosciences constitutes the Proceedings of the 5th workshop of this ILP task force, which took place between December 6 and 11, 2009, in Abu Dhabi, being hosted by the Ministry of Energy of the Emirates.

F. Roure (✉)
IFP Energies Nouvelles,
Rueil-Malmaison, France
e-mail: Francois.Roure@ifpenergiesnouvelles.fr

M. Scheck-Wenderoth
GFZ,
Potsdam, Germany
e-mail: leni@gfz-potsdam.de

A. Gahnoog
Ministry of Energy,
Abu Dhabi, United Arab Emirates
e-mail: agabdi@moenr.gov.ae

T. Pharaoh
British Geological Survey,
Keyworth, UK
e-mail: tcp@bgs.ac.uk

About 170 participants from 20 countries (60% from the Middle-East, i.e. Emirates, Saudi Arabia, Oman, Yemen, Iraq, Iran, Syria, Jordan, and Kuwait, 40% from Europe—France, Germany, The Netherlands, UK, Sweden, Norway, Poland-, Canada, USA, Egypt, and Japan, with 30% from national research institutes, 30% from universities, and 30% from industry) attended the 2.5 days of conference. Fifty oral contributions and 23 posters were presented during this conference, which comprised ten sessions dedicated to the "Geodynamics, paleogeography and tectonic evolution of the Arabian plate and its surroundings", "Lithosphere dynamics and crustal architecture of the Zagros Mountains and Oman Range", "Lithosphere dynamics of intracratonic basins", "Geodynamic and petroleum framework of Saudi Arabia", "Vertical motion, basin formation and deformation in Europe and Black Sea area", "Stress and strain", "Basin development and sedimentary infill in the UAE and adjacent countries", "Regional fluid transfers and dolomitization diagenesis", "Source rocks, thermicity and petroleum modelling", and "Continental crust, 3D lithosphere models and ophiolites". One pre-conference field trip was also organized by colleagues from the UAE University to Al Ain and its vicinity (Fowler et al. 2009) whereas the BGS team guided the post-conference field trip to Dibba (Ellison et al. 2009).

After peer review, 11 manuscripts have been accepted for publication in this special issue, which is published just 1 year after the conference.

The seven first papers focus on various aspects of the geology of the United Arab Emirates:

In his contribution, Ken Glennie provides a comprehensive introduction to the geology and stratigraphic development of the UAE in the context of the Arabian plate. It his followed by two papers resulting from extensive field work in the Oman Range, i.e. a paper by Fontana et al., which describes the lithostratigraphy, sedimentology and diagen-

esis of Permo-Triassic (Khuff equivalent) carbonate outcrops of the Northern Emirates, and a paper by Warrak, which provides key information on the post-nappe stratigraphy and structural style of the Hatta Zone.

The four next papers present some results of the work performed by BGS and IFP Energies Nouvelles in the Northern Emirates, on behalf of the Ministry of Energy of the Emirates:

In their contribution, Tarapoanca et al. describe in detail the architecture of a regional transect and provide a new structural scenario for the evolution of the Emirati foothills, based on the interpretation of deep seismic profiles recorded by Western-Geco, new Apatite Fission Track data and forward Thrustpack kinematic modelling. Using the result sections of this 2D Thrustpack modelling as input data for further Ceres 2D modelling, Callot et al. present numerous petrographic evidences for diagenesis of Cretaceous platform carbonates operating in an open system, and compare these paleo-fluid signatures with incremental fluid flow reconstructions. In another paper based on extensive field survey and mapping, Goodenough et al. describe very accurately the petrography of the Semail Ophiolite in the Northern Emirates, and propose new scenarii for its magmatic history. Ultimately, Naville et al. document the architecture of the sole thrust of the Semail Ophiolite and its overall unroofing history and residual thickness, based on surface geology, Apatite Fission Track data from plagiogranites, as well as new reflection and refraction data.

The four last papers deal to geodynamic modelling and discuss the evolution of rift basins and passive margins:

In their manuscript, Elesin et al. describe a new geodynamic code, Samovar, which takes into account the rheology of the lower crust. They have applied this code to simulate the evolution of the Baikal rift, suggesting a complete decoupling between the brittle deformation operating in the upper crust, and the regional thinning of the infracontinental mantle, due to a lateral flow of the intervening lower crustal material. Based on new field work in the serpentinite mélanges and ophiolites of the Kermansha area, in the Zagros Mountains, Wrobel-Daveau et al. describe new evidence for mantle exhumation during the early stages of the evolution of the Arabian margin of the Tethyan Ocean.

In the two last papers dedicated to the geology of Yemen, As-Saruri provides a comprehensive description of the sedimentary basins of this country, whereas Khanbari and Huchon focus on the paleostress reconstruction of its volcanic margins.

1- Ken W. Glennie, **Structural and stratigraphic development of Abu Dhabi in the context of Arabia**.

2- Simone Fontana, Fadi H. Nader, Sadoon Morad, Andrea Ceriani and Ishan S. Al-Aasm, **Diagenesis of the Khuff Formation (Permian-Triassic), northern United Arab Emirates**.

3- Mohammed Warrak, **Forced folding of the neo-autochthonous Late Cretaceous-Early Tertiary sequence at the western end of the Hatta Zone, Northern Oman Mountains.**

4- Mihai Tarapoanca, Paul Andriessen, Karine Broto, Louis Chérel, Nadine Ellouz-Zimmermann, Jean-Luc Faure, Anne Jardin, Charles Naville and François Roure, **Forward kinematic modelling of a regional transect in the Northern Emirates, using geological and apatite fission track age constraints on paleo-burial history.**

5- Jean-Paul Callot, Liesbeth Breesch, Nicole Guilhaumou, François Roure, Rudy Swennen and Nadège Vilasi, **Paleo-fluids characterization and fluid flow modelling along a regional transect in Northern United Arabab Emirates (UAE).**

6- Kathryn Goodenough, Mike T. Styles, D.I. Schofield, R.J. Thomas, Q.G. Crowley, R.M. Lilly, J. McKervey, D. Stephenson and J. Carney, **Architecture of the Oman-UAE Ophiolite: evidence for a multi-phase magmatic history.**

7- Charles Naville, Martine Ancel, Paul Andriessen, Patrice Ricarte and François Roure, **New constraints on the thickness of the Semail Ophiolite in the Northern Emirates.**

8- Yuri Elesin, T. Gerya, Irina M. Artemieva and Hans Thybo, **Samovar: a thermo-mechanical code for modeling of geodynamic processes in the lithosphere—application to basin evolution.**

9- Jean-Christophe Wrobel-Daveau, Jean-Claude Ringenbach, Saeid Tavakoli, Geoffrey M.H. Ruiz, Pierre Masse and Dominique Frizon de Lamotte, **Evidence for mantle exhumation along the Arabian margin in the Zagros (Kermansha area, Iran).**

10- Mustafa Abdullatif As-Saruri, **Sedimentary basins of Yemen: their tectonic development and lithostratigraphic cover.**

11- Khaled Khanbari and Philippe Huchon, **Paleostress analysis of the volcanic margins of Yemen.**

From left to right: Khalid Al Hosani, deputy director, Saleh Al Mahmoudi, director, and Abdullah Gahnoog, scientific advisor, Ministry of Energy, Abu Dhabi

From left to right: Awad Al Otaiba, advisor of the Minister, Khalid Al Hosani, deputy director, and Sierd Cloetingh, president of the International Lithosphere Programme

Acknowledgements ILP express its warmest thanks to H.E. Nasser Mohamed Al Sharhan, Saleh Al Mahmoudi, and Khalid Al Hosani from the Ministry of Energy, for hosting this 5th Workshop of the ILP Task Force on Sedimentary Basins in the Royal Meridien Hotel in Abu Dhabi. ADCO (Abu Dhabi Company for Onshore oil exploration), ADMA-OPCO, BGS, Emarat, Exxon-Mobil, IFP Energies Nouvelles, NDC, Schlumberger, the United Arab Emirates University (university of Al Ain) and ZADCO (Zakum Development Company) provided also direct support to the conference. We would like also to thank Richard Ellison (BGS), Christoph Lehmann (ADMA-OPCO), Heshan Shebl (ZADCO and Emirati Society of Geosciences), Abdulla Al Mansoori (ADCO), A. Aldahan and Osman Abdelghany (UAE university), Stephen Lokier (PI), and other colleagues from the local companies who provided guidance and assistance during the field trips. Also, the many colleagues and Earth scientists who contributed to the peer review of the manuscripts submitted to this special issue of the AJGS are acknowledged for their efforts and support.

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Task Force VII
3D geomechanical modelling of geodynamic processes in the lithosphere

Scientific Report and Outlook 2010-2011

Oliver Heidbach (Chair)
Helmholtz Centre Potsdam – German Research Centre for Geosciences GFZ, Potsdam, Germany

I. Introduction

The new ILP Task Force VII was established in mid 2010 in order to organize a network of scientists that work in the field of geomechanical numerical modelling of geodynamic processes in the lithosphere. Focus of the Task Force is rather on the contemporary kinematics and dynamics on short time scales that that cover several seismic cycles.

The recent achievements in data compilations of the lithosphere and crustal structure, their physical properties as well as details of the contemporary temperature, stress and strain field have increased significantly over the past decade (Kreemer *et al.*, 2003; Cloetingh *et al.*, 2007; Tesauro *et al.*, 2008; Heidbach *et al.*, 2010a; Heidbach *et al.*, 2010b) enable us to study in 3D the processes that deform the lithosphere and shape the Earth's surface, to interpolate between known parameters and field values as well as to predict the deformation in time and space. Furthermore with the advent of modern space geodesy the number of sites with high precision time series is steadily increasing and new tools like PS-InSAR provide unforeseen spatial coverage of precise observations of the Earth's surface deformations.

The numerical tools and concepts that are needed to quantify the contemporary processes of stress and strain accumulation and release through time and space in three dimensions have just begun to arise in the past decade (Chéry *et al.*, 2004; Fialko, 2006; Buchmann & Connolly, 2007; Masterlark & Hughes, 2008; Kurfeß & Heidbach, 2009; Hergert & Heidbach, 2010; Hughes *et al.*, 2010). Furthermore, the computational power is nowadays not a limit anymore. Even large-scale numerical models with coupled field equations and several million discretization points can be solved without extensive technical effort. However, despite the increase of input data and availability of numerical tools and computing power, there are still three major challenges that must be addressed: (1) Integration of structural and physical data sets and rock properties from various sources into 3D models. (2) Calibration of the model results by using appropriate model-independent kinematic and dynamic constraints from a wide range of geodisciplines such as structural geology, paleoseismology, satellite geodesy and geophysics. (3) Quantification of the impact of model assumptions and uncertainties of the model parameters on the model results.

These technical issues are of key importance to further enhance our knowledge of the geodynamic processes. Thus, one of the key objectives of the Task Force is to establish a network of experts and to foster communication amongst them, to exchange the state-of the art of technical concepts, pitfalls and to discuss and present the results of case studies of selected natural laboratories where the concepts can be tested.

II. Objective

The overall goal of this network is to identify, assess and quantify the geodynamic processes that deform the Earth's crust and lithosphere by means of 3D geomechanical models. Furthermore, the Task Force aims at linking the modellers with the researchers that observe the geodynamic processes in order to foster closer communication between them. The linkage of these groups is of great importance since they are often separated to large extend. As a consequence numerical model results are often in contradiction with field observations, or model assumptions are invalid. Vice versa the usage of model results by field geoscientists is sometimes inappropriate and overestimates the validity of the model results. It is expected that the link will produce synergies such as faster exchange and better understanding of the model input and the observations needed for model calibration. Vice versa the field geoscientists will have deeper insight on the limits of model results.

In particular this Task Force aims at providing a platform and a network for young scientists to present and discuss their model concepts. The aim of the Task Force is to attract young researchers as well as experienced experts that are willing to share their expertise in geomechanical modelling in order to jointly improve our knowledge of geodynamic processes.

III. Work plan

- Organisation of a kick-off meeting/workshop at the GFZ Potsdam in 2011
- Organisation of EGU sessions
- link of the Task Force to the yearly US/Canada expert meeting of the modellers in Boulder, Colorado (geodynamic.org workshops)
- establish links to industry related 3D geomechanical reservoir modellers
- Final phase: Editing of a special issue in an international peer-reviewed journal; working title: *The next generation of geomechanical models*

Potsdam, December 1st , 2010

Oliver Heidbach
(Chairman of Task Force VII)

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Ulrich Achauer
EOST-IPG
Laboratoire de sismologie
Université de Strasbourg

November 2010

Statusreport of the task forces LABPOX (2010 -) and PLUME (2005-2009)

LABPOX:

The year 2010 has seen the creation of a new task force dedicated to the research of the enigma of the lithosphere-asthenosphere boundary, called **LABPOX** « lithosphere-asthenosphre boundary paradox ».

Rationale:
The lithosphere-asthenosphere boundary (LAB) is the most extensive and active plate boundary on the Earth. However, the LAB beneath the continents the LAB is relatively cryptic compared to other first-order structural subdivisions of Earth. Though we face different physical definitions of the LAB in dependence on methods used to map the boundary, a general understanding "WHAT is the LAB is still missing". One of the major challenges for seismologists presented by the IRIS-NSF-co-funded workshop on "Seismological Grand Challenges in Understanding Earth's Dynamic Systems" (published by IRIS in January 2009) was as challenge No. 7 (out of the ten grand challenges): "what is the lithosphere-asthenosphere boundary?". This demonstrates the importance seismologists devote to the above subject.
From the recent DefLAB workshop (2009 Dublin, http://www.dias.ie/deflab) it may be concluded that while a lithosphere-asthenosphere boundary is seen by most disciplines in Earth Sciences, the definition, the depth and what it means from the structural, the rheological and physico-chemical point of view is highly debated. There seem to be several "boundaries", namely the LAB-S (seismological), the LAB-M (mechanical), the LAB-T (thermal), the LAB-C (chemical) and the LAB-E (electromagnetic), all called by the colleagues from the particular fields in Earth Science "LAB" which differ in depth and thickness (i.e. whether they are discrete or more like a transitional layer) and most likely will not "define" at all the same thing!

It is evident that only a multi-disciplinary approach, bringing together all disciplines from Earth Sciences will help us to shed light on the above question and to better understand and communicate between the different fields in Earth Sciences, what the lithosphere-asthenosphere boundary is all about, what it's origin is and what role it has played and still plays in the evolution of our planet.

The new task force has been established during the recent second « New frontiers in Earth Sciences » workshop in Potsdam (October 2010). Here the chairman and some prominent members of the new task force gave presentations on the current state of affairs concerning the research on the LAB.

1. Achauer, U. "What is the lithosphere-asthenosphere boundary – a quest for information"
2. Plomerova, J. and V. Babuska. "European LAB constrained from seismic anisotropy"
3. Jung, S. "The nature of the lithosphere-asthenosphere boundary – constraints from high-precision multi isotope (Sr, Nd, Pb,Hf, Os) and HFSE (Zr-Nb-Ta-Hf) data"
4. Abratis, M., Brey, G., Viereck-Goette, L. "Age and textural anisotropy of the SCLM derived from studies on xenoliths of the Central European Cenozoic Igneous

Province (CECIP)"

5. Babuska, V., Plomerova, "Continental mantle lithosphere as a patchwork of micro-plates with their own pre-assembly 3D seismic anisotropy signature"
6. Artemieva, I.M., Thybo, H. "An Overview of Structure and Evolution of the Lithosphere in the North Atlantic Region"

The next steps of the task force will be

1. The setup of a network of interested scientists based on those scientist who have reported their interest in the participation of the task force
2. A symposium at the EGU 2011 in Vienna with the title: **The Lithosphere-Asthenosphere Boundary (LAB) Dilemma,** co-organized by GD2.4/SM4.1/TS10.2 and ILP. The idea is not only to have state-of-the art presentations but to discuss with a broader public the main targets and goals established by the task force members.
3. A splinter meeting of the task force members and other interested scientists to discuss the most important issues to concentrate in the first two years and to set up a coordination committee.
4. The setup of a task force home page.

Task force VIII – PLUME (2005-2009):

Rationale:

In recent years a number of high-resolution integrated seismic projects across areas with Tertiary to recent volcanism in central Europe have been stimulated by the project TRACK (tracking a mantle plume by seismological means) in combination with detailed geochemical studies. These have demonstrated the existence of a number of small-scale, almost cylindrical, upwellings of low-velocity mantle material (~ 100-150 km in diameter) within the upper mantle, the so-called "baby-plumes". These "baby-plumes" have some very similar characteristics to classical plumes (as proposed by Schilling and others), but two distinct differences:

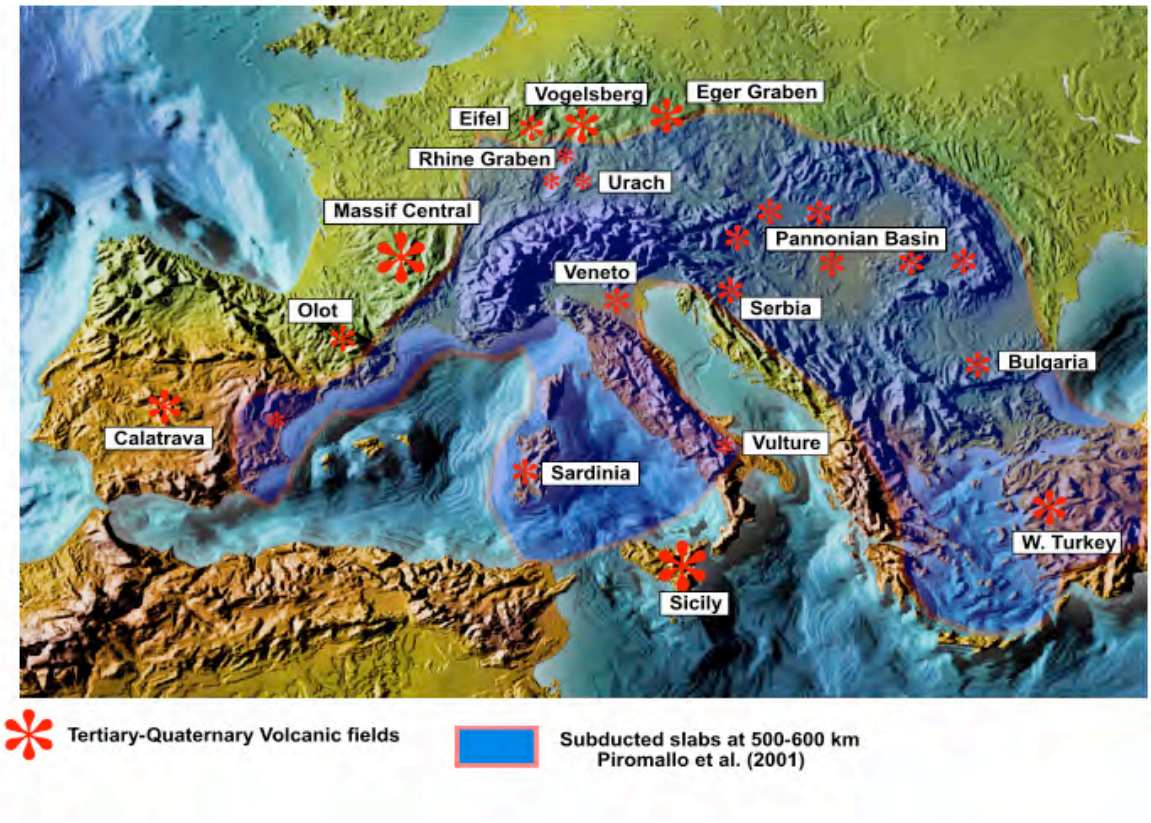
- They are much smaller in size than classical plumes
- They do not seem to "have" a plume head

These baby-plumes suggest that there might exist a number of different classes of plumes originating from different depths (i.e. different interfaces) within our planet. So far these baby plumes have mainly been identified within the European mantle, but some new results from China (work by D. Zhao; Zhao et al., 2004, 2007, Zhao, 2007, Huang and Zhao, 2006) suggest that similar regimes exist there. This highlights the necessity to search for these kind of features on other continents as well.

The following features seem to be characteristic of these baby-plumes in Europe:

• Small-scale convective instabilities within the upper mantle beneath Europe appear to originate in the mantle Transition Zone (410-660km depth)
• There is a strong correlation between the location of "upwellings" and lithospheric architecture
• The upwellings appear to be concentrated around the edge of a region of subducted slabs at the base of the upper mantle
• Basaltic magmas derived by decompression partial melting of the upwelling mantle "diapirs" have

the distinctive geochemical signature of a common mantle source component – the European Asthenospheric Reservoir (EAR)
EAR: European Asthenospheric Reservoir (Granet, Wilson and Achauer,1995. Imaging a mantle plume beneath the French Massif Central, Earth and Planetary Science Letters, Volume 136, Number 3, December *1995* , pp. 281-296(16)



The figure outlines a possible relationship between the young volcanic fields in Europe and the region of high-velocity in the mantle transition zone which may be contributed to subducted slabs.

Introduction:

The above mentioned rationale and subjects were presented and discussed at a first task force inauguration workshop in March 2006 at Mt. St. Odile (abstract volumes are still available from the chairman – the workshop programme is available on the ILP homepage).
It was decided to enlarge the scope of the project to other continents as well. A result of which is the key presentation of D. Zhao at the joint task forces workshop in 2009 in Clermont-Ferrand (see paragraph on the CF-workshop). Over the years a number of field projects have been carried out in which task force members were involved (see paragraph on projects). Several of the subjects outlined in the Mt. St. Odile workshop have been heavily debated over the years (as aboves figure) and discussed in several sessions at international meetings organized by the task force members (see paragraph on meetings).

Projects carried out during the task force lifetime and recent results:

1) The PLUME task force has been involved in an International Polar Year seismic project, (LAPNET) in the arctic region . In this project it is not only the detailed knowledge of upper mantle structure that is of major concern but whether in an environment like an old craton, which has not

experienced any major tectonic events for over one billion years, it is still possible to trace subduction and plume related features across the Archean-Proterozoic boundary.
The LAPNET array is part of the POLENET project and most likely the biggest array ever installed in the arctic region. The LAPNET consortium includes several seismological institutions from the Baltic states as well as other European countries and covers essentially the northernmost part of Finland and adjacent countries. LAPNET research will result in a detailed 3D seismic model of the crust and upper mantle down to the mantle Transition Zone. The new seismic experiment will provide unique, more precise information on lithospheric structure and thickness beneath the Karelian craton, with its high diamond potential, as well as the area of transition from Archean to Proterozoic lithosphere. More information can be obtained from Dr. Elena Koslovskaya, Oulu University, Finland.
First LAPNET presentations will be given at the AGU 2010 in San Fransisco and the EGU 2011. The data processing is in full swing.

2) A detailed geodynamic study of the Pannonian Basin in Hungary, involving a consortium of Austrian, British, French and Hungarian scientists, aimed at studying the geodynamic evolution of the Pannonian Basin by using broadband seismology, lithospheric tomography and numerical modelling of lithosphere dynamics. Preliminary results were presented at a workshop in Siofok, Hungary (2007) and at EGU meetings in 2007 and 2008. More details on this project can be obtained from Greg Houseman and Graham Stuart of Leeds University, UK (greg@earth.leeds.ac.uk).
3) Considerable progress has been made in the geochemical characterisation of the upper mantle beneath Europe and the relationship of mantle heterogeneities to mantle dynamics. A European Mantle workshop (EMAW) was held in August 2007 in Ferrara, Italy, followed by a symposium at the 33rd IGC in Oslo, Norway, in August 2008. Papers based on the EMAW workshop will be published in a thematic issue of Journal of Petrology in 2010.
4) A new paradigm for the origin of "baby plumes" in the upper mantle has been proposed which attributes these features to supercritical fluid streaming from the 410 km seismic discontinuity at the top of the Transition Zone (Wilson, 2008).

Issues of the task force which are currently heavily debated and which need further research:

There are a number of issues which need further research efforts to shed light on the origin and nature of baby-plumes:

1. It still needs to be established if the small plume-like instabilities which are observed beneath the European continent are interconnected at a certain depth.
2. There is still debate on the source region of mantle plumes in general and baby-plumes in particular. Only much larger and denser seismic antennas, such as e.g. foreseen with the EPOS initiative, will eventually give the necessary data to tackle this particular question.
3. Detailed studies of the Transition Zone region are of particular interest in identifying the source of the baby-plumes. Integrated seismic studies, using all available seismic techniques, will be necessary to resolve this in combination with other geophysical and geochemical data sets.

Workshops and Meeting sessions of the PLUME group

1. PLUME inauguration workshop in march 2006 in Mt. St. Odile (ask chairman for aditional abstract volumes)
2. Participation in the symposium « New frontiers in integrated Earth Sciences », Potsdam

2007
3. PLUME session at the EGU 2008
4. PLUME session at the IGC33 in Norway 2008
5. Joint Task Forces workshop in Ensenada, Mexico 2008 (see ILP homepage for details)
6. Joint Task Forces workshop in Clermont-Ferrand 2009

The concluding task force workshop in Clermont-Ferrand:

The Joint task forces workshop in Clermont-Ferrand in october 2009 was seen as the perfect setup to show at the end of the programmed time of the task force VIII « PLUME » the highlights of the research which was carried out over the years by the task force members and at the same time to have a platform to discuss these results with a broader ILP community. For that it was decided to have a number of key-lectures on hot issues covered by the task force by prominent scientists in the field and to also show the variety of subjects covered. The themes covered by the key notes were:

- Seismic imaging of mantle plumes by D. Zhao
- Geodynamics of the Yellowstone Hotspot: Seismic and GPS Imaging, Kinematics, Mantle Flow by R. Smith and collaborators
- Upper mantle structure beneath the western Bohemian Massif – plume or asthenospheric upwelling? by U. Achauer and collaborators
- Models of large-scale mantle flow and resulting hotspot motion: Implications for absolute plate motion reference frames and plume-ridge interaction by B. Steinberger
- Mantle–lithosphere interactions: insights from lithosphere-scale problems by E. Burov

More details on the joint task force workshop and the whole program can be found on the ILP homepage.

Recent publications:

Huang, J. and Zhao, D., 2006. High-resolution mantle tomography of China and surrounding regions. *J. Geophys. Res*. 111, B09305.

Landes, M., Ritter, J.R.R. and Readman, P.W., 2007. Proto-Iceland plume caused thinning of Irish lithosphere. Earth Planet. Sci. Lett., 255, 32-40, doi:10.1016/j.epsl.2006.12.003.

Lei, J., D. Zhao, B. Steinberger, B. Wu, F. Shen, Z. Li, 2009. New seismic constraints on the upper mantle structure of the Hainan plume. *Phys. Earth Planet. Inter*. 173, 33-50.

Nolet, G., R. Allen, D. Zhao ,2007. Mantle plume tomography. *Chemical Geology* 241, 248-263.

Plomerová, J., **Ulrich Achauer**, Vladislav Babuška, Luděk Vecsey and BOHEMA working group, 2007. Upper mantle beneath the Eger Rift (Central Europe): plume or asthenosphere upwelling?, GJI, 169, 675-682.

Smith, R. et al., 2008. Geodynamics of the Yellowstone Hotspot and Mantle Plume: Seismic and GPS, Imaging, Kinematics, Mantle Flow; Journal of Volcanology and Geothermal Research

Tondi, R., **U. Achauer**, M. Landes, R. Davı, L. Besutiu, 2009. Unveiling seismic and density structure beneath the Vrancea seismogenic zone (Romania), JGR, 114, B11307-11330.

Wawerzinek, B., Ritter, J.R.R., Jordan, M. and Landes, M., 2008. An upper-mantle upwelling underneath Ireland revealed from non linear tomography, Geophys. J. Int., 175, 253-268, doi:10.1111/j.1365-246X.2008.03908.x .

Wilson, M. 2008 Fluid streaming from the Transition Zone as a trigger for within-plate magmatism Geophysical Research Abstracts, Vol. 10, EGU2008-A-05636.

Zhao, D., J. Lei, Y. Tang (2004) Origin of the Changbai volcano in northeast China: Evidence from seismic tomography. *Chinese Science Bulletin* 49, 1401-1408.

Zhao, D. , S. Maruyama, S. Omori (2007) Mantle dynamics of western Pacific to East Asia: New insight from seismic tomography and mineral physics. *Gondwana Res.* 11, 120-131.

Zhao, D., 2007. Seismic images under 60 hotspots: Search for mantle plumes. Gondwana Res. 12, 335-355.

TF IX

Petrogeodynamics of HP-LT rocks: state of the art and application to processes along the subduction channel

P. Agard and the members of the new ILP task force "Probing subduction zones"

philippe.agard@upmc.fr

Based on examples from the Betics, Oman, Turkey and the W. Alps, this contribution attempts to (1) critically evaluate the precision with which metamorphic P-T-t histories are retrieved at present and (2) discuss the implications on our understanding of processes taking place along the subduction channel. Emphasis is also placed on showing how timely it is to combine these data with geophysical and geochemical data, as well as with thermomechanical models.

Thanks to improved interconsistent thermodynamic databases, multiple thermodynamic softwares and analytical tools, numerous quantitative constraints on metamorphic histories are now accessible. I herein assess the merits and shortcomings of our present knowledge. I then focus on processes related with oceanic and continental subduction, based on our current knowledge of metamorphic histories worlwide.

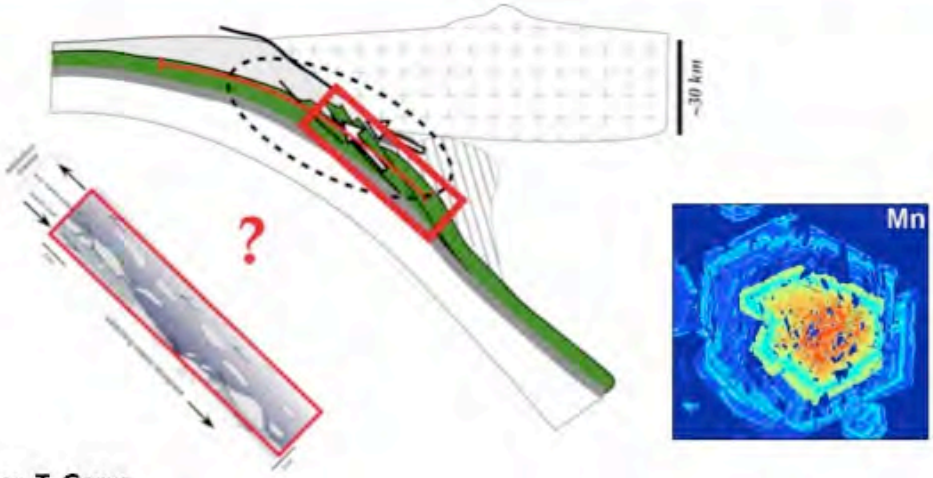
In the W. Alps in particular, the comparison between the metamorphic evolution of the Schistes Lustrés paleoaccretionary complex and that of major ophiolitic bodies returned from the Alpine subduction (Zermatt-Saas, Avic, Rocciavre, Monviso) allows placing constraints on the nature and characteristics of the plate interface (eg, the so-called 'subduction channel') and reconstructing the geodynamic processes at work in a subduction zone. The dimensions of the bodies sliced up and stacked in the subduction channel, the depths and possible mechanisms at which this happens, and the role of fluid transfer are discussed, as well as along strike variations of the exhumation processes within the same subduction zone.

ILP

task force / « Subduction channel processes »

NEW!

Improve our knowledge / subduction processes (0-120 km) by confronting:
1) high resolution imaging of subduction planes,
2) petrological studies with detailed T-depth-time-fluid evolution,
3) constraints from thermomechanical /subduction dynamics, rheology...



P. Agard, A. Okay, B. Hacker, T. Gerya

A. Garcia-Casco (P, Sp), C. Chopin (P, Fr), CJ de Hoog (C, Uk), E. Burov (M, Fr), F. Rossetti (P, It), G. Abers (G, US), H. Raimbourg (M, Fr), K. Bucher (P, Ge), K. Hattori (C, Ca), L. Jolivet (T, Fr), M. Bostock (G, US), M. Bröcker (D, Ge), M. Scambelluri (P, It), O. Oncken (G, Ge), P. Monié (D, Fr), P. Yamato (P-M, Fr), R. Oberhansli (T, Ge), S. Guillot (T, Fr), T. Meier (G, Fr)

C: **Geochemistry** / D: **Geochronology**/ G: **Geophysics** / M: **Modeling** / P: **Petrology** / T: **Tectonics-Geodynamics**

- - - - - - - - - - -

Preliminary program:

Monday, 29 afternoon, 2 - 6:30 pm (T46-56, 2nd floor: follow the signs!)
-Start of presentations
-Apéritif!... and dinner
(+ jazz concert / jam session for those interested?...)

Tuesday, 30 morning, 9-12:30 am
-End of the presentations (if all don't fit on the monday)
-Lunch at Buisson Ardent (in front of the university)
-Projects for 2011: EGU session (april 3-8), Workshop in the Alps (~ july 1-10)

Tuesday, 30 afternoon 2-6 pm
-Major research targets and collaborations anticipated
-Plans for the future and funding strategy: ERC (eg, network through training and mobility of researchers/ESF/NSF (geoprisms)

ILP TASK FORCE ON SUBDUCTION CHANNEL PROCESSES

Basic facts
Identifying key processes
Understanding the complex interplay between these processes

These presentations should be very unformal and could be either 10-15' talks, or just throwing in a few slides with major questions/unknowns, depending on the time you have before the meeting!

PROGRAM:

Introduction / Petrogeodynamics, subduction channel processes and the ILP task force
Philippe Agard, Roli Oberhänsli

What petrology tells us, part 1

Large exhumed slices and cofacial PTt evolution: the W. Alps
Kurt Bücher

Melanges and melange formation in the Caribbean
Antonio Garcia-Casco

Exhumed portions from Turkey and Iran
Aral Okay, Roli Oberhänsli

What geophysics tell us

Places where subduction channel are imaged and at which resolution
Geoff Abers

ETS, SSE, fluid transfer and timescales of these processes
Michael Bostock

Seismological investigations of the Hellenic Subduction Zone in the area of Crete and the Egelados project
Thomas Meier

What petrology (and radiochronology) tell us, part 2

Fate of continental material along subduction planes
Christian Chopin

Dating subduction channel processes
Patrick Monié

What geochemistry tells us

Fluids along and down deep in the subduction zone
Marco Scambelluri

Volatile transfer to the mantle wedge and role of serpentinites
Keiko Hattori

Geochemical/mineralogical indicators of tectonic setting of serpentinites
Cees-Jan de Hoog

Insights from modelling

Analytical models: corner flow, rheology, fluids and metamorpshism
Hugues Raimbourg

Model configurations, key parameters
Evgueni Burov, Philippe Yamato

T regimes, T along the subduction plane and PTt paths
Taras Gerya

Integration: Tectonics/geodynamics

Example of a preserved, exhumed subduction channel?
Onno Oncken

Serpentinites: role and importance in the subduction channel
Stéphane Guillot

Coupling/decoupling processes in the channel in space and time
Laurent Jolivet

ILP / TOPO-EUROPE report 2010

TOPO-EUROPE, ILP regional coordinating committee Europe, organized in 2010 a large range of activities. As part of TOPO-EUROPE, the European Science Foundation (ESF) large scale collaborative research effort (EUROCORES), amounting to 13.5 Million EUR additional funding for the employment of 60 young researchers entered its second year of activities. A meeting was hosted by the TOPO-Norway-Team under the leadership of Trond Torsvik in early November 2010, attended by close to 100 participants. In addition a thematic TOPO-EUROPE symposium was held at EGU Vienna in May 2010.
The third special thematic volume on the results of the TOPO-EUROPE programme is to be published in late 2010 in the International Journal Tectonophysics.
TOPO-EUROPE is also involved in the scientific planning for the forthcoming TerMeX-Initiative, integrating coupled deep earth and surface processes in the Mediterranean realm, providing a natural bridge between Europe and Northern Africa.
TOPO-EUROPE has also played a pro-active role in the design of the European Plate Observing System (EPOS), selected for funding large scale infrastructure by the European Comission.